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LIGHT • HEAT • POWER • BYE-PRODUCTS

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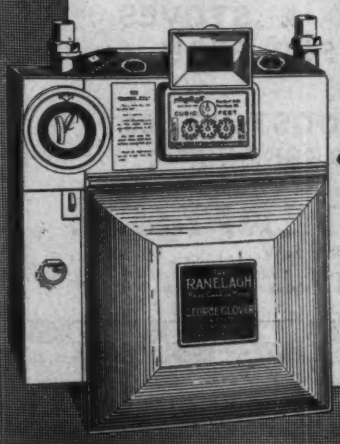

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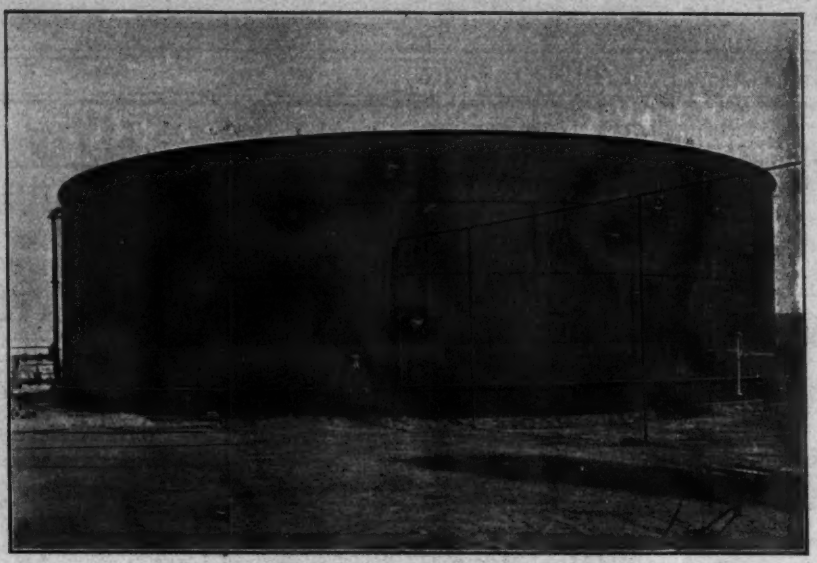

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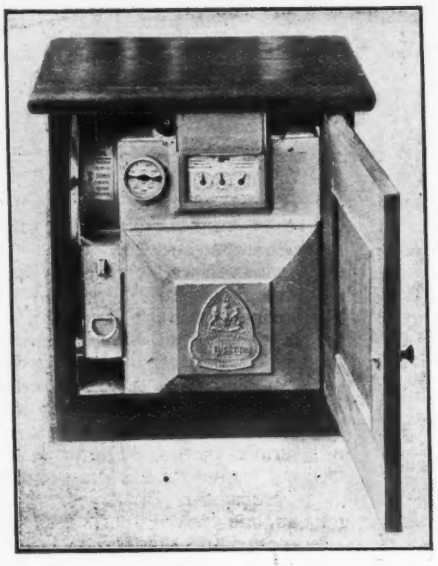

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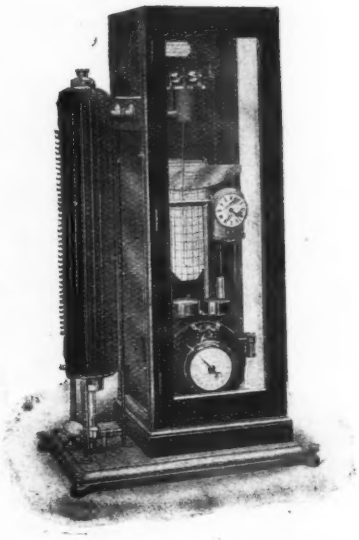

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VOL. CLX., No. 3111.] WEDNESDAY, DECEMBER 27, 1922. [74TH YEAR.

1922

A Retrospect.

CHRISTMAS festivities are over; and by the time this issue of the "JOURNAL" reaches our home subscribers, we shall be within four days of the close of a year which has not had features of outstanding importance or attractiveness for the gas industry. Still, there have been features good and bad. The price of coal has fortunately fallen further; but for the best screened sorts it is still some 100 p.ct. higher than before the war. The price of gas has been largely reduced; and there has been a considerable revival, and an excellent measure of success, in pushing for new business. Money for capital purposes, too, has become much easier; while structural materials and labour have been at costs lower than have been enjoyed for some years, and a large amount of plant extension, reconstruction, and reorganization work has been done. But contractors could do with more; and, in our opinion, the time—with cheaper money and prices lower—is opportune for carrying out work, and even for provision to be made well into the future. With a restoration of trade, prices of material will in all probability again ascend. The depression in industry generally has also meant a loss of business to many gas undertakings in manufacturing districts; and secondary products have not had the best of markets. Further, the industry has been subjected to two attacks in the columns of newspapers—a revival of the carbon monoxide controversy, and the groundless arraignment of the therm as an instrument contributing to high gas accounts. Invertebrate, both have died down, though an inquiry is being held, as the result of the latter, into the system of charging by the therm.

Of general importance has been the dramatic ending of the Coalition Government, and thus of experimental legislation, and the restoration of Party Government. Mr. Lloyd George has stepped back into the ordinary walks of political life, with many encomiums upon him for great work accomplished in the world's affairs, with certain mistakes not allowed by opponents to remain concealed by the mass of success. However, there is a quiet confidence that matters industrial, and thus the general interests of the country, will now improve, and that there will be a rest from fresh commitments which the country can ill-afford to-day with its enormous financial responsibility. The only political cloud is the evidence that, even in Parliamentary representation, Labour, in some quarters of the country, has allowed itself to be largely dominated by the socialistic element. While the sum of the components of the "opposition" to the new Government leaves the latter in possession of a good working majority, the Labour Party is now, in that opposition, the dominant member—in point of numbers.

COAL SUPPLY AND OTHER MATTERS OF INTEREST.

In the first place, a few points as to coal. The supplies for the year have fallen far short of those for 1913; but there has been ample for requirements, owing to the industrial depression at home. At the same time, British coal has largely recovered its lost foreign trade—that is to say, in respect of tonnage sent from our ports. Partly this is only ephemeral business due to the prolonged strike of miners in America, and consequent purchases from this country for the United States and Canada. But there has been a good growth of demand for the Continent—especially Germany—and South America has returned in no small measure to this country for supplies. In 1913, the quantity of coal exported was 73,400,118 tons, while up to the end of November this year, 58,243,742 tons had been sent abroad. Though this falls far short of the pre-war overseas sale, it is a magnificent advance on recent years. Durham, Wales, and Yorkshire were the principal fields to feel the good effect of this restoration of the export trade; but the inland fields all more or less participated, directly or indirectly. But what with the export bookings and the home demand, in the fall of the year Durham had little in the way of surplus output, though supplies were available elsewhere.

This raises rather a serious matter. The price of coal is to-day still about 100 p.ct. higher than in pre-war times. A question is as to the probability of this being largely reduced. Looking ahead, one cannot find factors that give much hope. One of the possibilities is that, when industry and trade have recovered their pre-war level, the output of coal will be insufficient to meet requirements, without restricting exports considerably. Sir Richard A. S. Redmayne has warned the country of this. He attributes it largely to the operation of the seven-hour day, which came into force after the Sankey reports, this particular recommendation of which has proved a serious economic disadvantage to the industry, and to the men themselves. Yet the latter, in their blindness, are willing to adhere to it—more perhaps at the behest of their leaders than from individual inclination. In the event of industry reviving, and export demand reaching the 1913 level, there would on current output capacity be a shortage of about 23½ million tons. Home trade and foreign business required in 1913 an output of 287·4 million tons; and the best production that can be expected now is 264 million tons a year. This is not a particularly cheerful outlook.

During part of the year, there was considerable unemployment and short-time working in the mining industry through the conditions of other home industries; and this again raised the question of miners' wages. That was before the rise of exports contributed relief. The conditions had in certain areas brought down, under the existing agreement, the rate of wages to the minimum in the case of the lower grade of workers. The Miners' Federation made an application for an increase of the minimum rate of wages; but the coalowners refused the application. If the miners would only try the effect of a return from a seven to an eight hour day, they would find that, under the last agreement entered into, of every 1s. per ton saved, they would be entitled to, and would receive, 83 p.ct. One authority estimates that the cost of production has been increased by 2s. to 2s. 6d. per ton through the seven-hour day. The amiable idea of Mr. Frank Hodges, the Secretary of the Miners' Federation, was that, if the price of coal was raised 3s. per ton, this would give all the satisfaction needed in respect of miners' wages. But it is questionable whether things are, or were, as bad as painted. In 1913, the coal industry's wages bill was £91,000,000; and for six months this would average £45,500,000. In the first six months of this year, the amount paid in wages was £65,367,526—an increase of 43 p.ct. In 1913, the average number of workers was 1,110,000; in the first six months of this year it was 1,095,000. In 1913, however, eight hours per day were worked. The figures do not confirm an "appalling poverty." Now the view of the Miners' Federation is that a State subsidy should be allowed. Why to the miners more than to the workers in other industries, some of whom are suffering more seriously, is not explained. The Prime Minister (Mr. Bonar Law) has, in the name of the Government, declined to entertain the idea. The Miners' Federation have now decided to call a national delegate conference

to consider the position. The representatives of the miners in the House raised an abortive debate upon the matter just before the prorogation.

Another feature of the year in respect of coal has been that there has been a large return on the part of gas companies to the purchase of coal under contract; and in some cases clauses have been inserted providing a limit to inerts. There has been some relief, too, in respect of railway rates.

QUALITY AND AN EXPERIMENT.

Speaking of inerts, there has been a fairly general improvement in this respect; but without specific provision of limitation, unless best screened sorts are purchased, there is still much to be desired in this regard. The South Metropolitan Gas Company are now controlling the quality of their coal supplies at Newcastle, through a laboratory that they have established there. An account of this was given by Mr. G. M. Gill, the then Chief Engineer of the Company, in a paper at a joint meeting of the Institution of Mechanical Engineers and the Society of Chemical Industry. That was early in January last. Since then, in papers and addresses, a plea has been advanced for the introduction of some co-operative means for controlling coal supplies; but no definite movement towards taking action has been made. It is evident that to day there can be little reliance upon quality by purchasing coals under their nominal descriptions; coal even from the same seam varies greatly in quality. The Board of Fuel Research are engaged on a chemical and physical survey of the national coal resources; and they have also appointed a Committee to advise upon the sampling and analysis of coal.

There can be no gainsaying that, if gas coal could be thoroughly purified, it would result in working economy, and an improvement in the products, especially coke. At the meeting of the South Metropolitan Gas Company last spring, Dr. Carpenter referred to a new piece of enterprise in which the Company are indulging. They were, he stated, arranging to instal at their experimental works a process for purifying coal before its conversion into gas and other products. The scheme he mentioned was purely tentative, and whether it would prove to be an economic success had then to be proved. We have since heard nothing more of this; but perhaps Dr. Carpenter will tell the proprietors the results of the exploration at their next meeting.

NATIONALIZATION.

In connection with the General Election, the Labour Party issued a programme, one salient of which was nationalization—nationalization of coal, railways, and public utility undertakings generally, as well as a capital levy. Fortunately, the results of the election save us from all controversy on these points; and we will not deal with them here. But some remarkable statistics have been published by Mr. Finlay A. Gibson, which may be placed on record for future reference, bearing as they do on the question of nationalization. One cannot avoid recognition of the fact that it is only since the mining industry has been released from Government control that it has shown its capacity to adjust itself to the competitive and economic conditions of the world and international trade, and to its natural position as the servant and not the master of the community. In the following tables are a few facts showing the course of the industry under private enterprise before control, under Government control or semi-nationalization, and again under private enterprise:

Pre-War Period of Private Enterprise.

	1894. Tons.	1913. Tons.	Increase. Tons.
Output	188,277,000	287,411,000	99,134,000
Exports	31,700,000	73,400,000	41,700,000
Pit-head price	6s. 7d.	10s. 1d.	3s. 6d.
Costs	5s. 9d.	8s. 8d.	2s. 11d.

Under Government Control or Semi-Nationalization.

(Based on March Quarter.)

	1913. Tons.	1921. Tons.	Decrease. Tons.
Output	287,411,000	215,500,000	71,911,000
Exports	73,400,000	24,600,000	48,800,000
			Increase.
Pit-head price	10s. 1d.	29s. 3d.	19s. 2d.
Costs	8s. 8d.	35s. 5d.	26s. 9d.

Under Private Enterprise Since June, 1921.

(Based on latest returns.)

Output increased to 265 million tons per annum.
Exports increased to 81½ million tons per annum.
Price reduced to 16s. 5d. per ton.
Costs reduced to 15s. 2d. per ton.

What (says Mr. Gibson) accentuates the significance of these figures is that they have been attained in spite of high railway rates, high shipment charges, and other disadvantages.

THE POSITION TOWARDS THE CLOSE.

From the gas industry there was, as the winter season approached, and onwards with the Christmas Holidays in view, a fairly considerable demand for coal—not only for current use, but for stocking purposes. Except in the Durham area, there was, well into the autumn, a fairly large available supply of coal. But Durham had booked-up rather tightly for not only home gas-works requirements, but for export; and the collieries had little surplus of which to dispose. This meant that quotations in Durham were, during this period, well maintained; but the prices for home delivery were much the same as those charged for export. At the beginning of December, Durham quotations were round about 25s. for specials, other good-class coals were at 24s. 6d., and seconds were obtainable at 22s. 6d. But somewhat earlier 23s. to 23s. 6d. had been quoted for seconds, which was about 10s. below the pre-strike quotation. From Yorkshire, during the latter months, there came reports of plenty of available coal. In the early autumn 21s. 8d. per ton delivered at works was a price paid for Yorkshire coal, which meant at the pit for the bulk 17s. to 18s.—the delivered prices being in the neighbourhood of 17s. lower than the pre-strike price. Lancashire prices had closer approximation to Durham figures—being somewhat higher than Yorkshire. Quotations and the prices at which contracts are made by bargaining are not quite in the same street; and the intrinsic value of the grades varies so much that figures are of little real value, save for general direction, unless all the circumstances are disclosed. Derbyshire prices were tempting. But while exports continue at the present high level, and industrial demand is on the up grade, prices are not, at present, likely to be affected in the downward direction. The winter demand will have to cease before this can happen.

SECONDARY PRODUCTS.

The price of coal having descended, coke naturally followed suit. The business done in it has varied rather considerably in different parts of the country. Industrial depression caused a shrinkage in demand, and stocks accumulated in some manufacturing areas. In other quarters, reports show that there has been little of which to complain as to the volume of business, having regard to the various influencing factors. In the circumstances, prices have differed by several shillings as between one place and another, and so nothing is to be gained by putting on record even sample prices. But at the time of writing, retail prices in London are advertised at 38s. 4d. per ton, and 40s. for broken. The export business in gas coke mounted up during the year. Up to October, 700,642 tons had been exported. In the month of October, for gas coke shipments, the average volume was put at £1 6s. 9·9d. per ton. In 1920, something like an average of £6 was obtained. By the end of November, the exports of gas coke had reached 816,322 tons. The work of the London Coke Committee continues to have good effect. More and more coke is being used for steam-raising; and for domestic purposes various special coke grates are now on the market. We shall shortly be publishing a brochure by Mr. G. M. Gill on the question of developing coke sales.

Tar and tar products have done well during the year. Probably this is partly due to the very slow return made by bye-product coke-ovens to active operation. Pitch has nearly doubled its price during the year; but throughout there has been great irregularity in market values, according to port. London has throughout taken the lead. The quotation in January was 62s. 6d. per ton; and in the provinces between 50s. and 60s. In December one quotation was 125s. for London, and in the provinces from 106s. to 120s. according to port. There was a little tendency to a weaker condition towards the close. Tar also ascended in

value during the year. Quotations at the beginning were between 37s. 6d. and 42s. 6d.; while latterly from 65s. to 70s. has been quoted. Creosote has moved up by 1d. or 1¼d. per gallon in London; but in the provinces the opening prices of the year and those obtaining at the close, while showing a little hardening, have not changed.

As to sulphate of ammonia, there has been a gradual moving-up of price, and purchasing has been good, with a larger quantity being exported. The home price in July and August, for example, was £16 3s., neutral quality, 25¾ p.ct. ammonia; while in September and October, £16 8s. was the price; and in November and December, £16 13s. Up to the end of November, 127,388 tons had been shipped abroad, which was an increase of 11,223 tons on the corresponding period of 1921. The Sulphate of Ammonia Federation had a very active time during the year; and comprehensive survey and diplomatic circumspection had to be brought to bear in shaping their policy. Events demonstrated that what was done was right; and the Chairman (Mr. D. Milne Watson) and his colleagues on the Committee, together with the officials of the Federation, have received for what they did the approbation of the makers of a very high percentage of the production of the country. We have recently dealt with these matters in the "JOURNAL." There are three or four points that may be specially brought out. One is that the prospects of sulphate for the immediate future are good; the second is that statistics published by the Federation disclose a wide scope for improving home demand; a third is that, having regard to the development of new sources of supply, the fact that Synthetic Ammonia and Nitrates, Ltd., have joined the Federation is a matter for congratulation; and the fourth is that some 60 p.ct. of the production of this country is now neutral and dry. In every respect the makers represented in that 60 p.ct. are meeting the demand of buyers for higher quality and merit. Regarding the future, though at the moment Germany is absorbing the whole of her own production of sulphate, and prices have risen there, the capacity of her synthetic plants, and the development of plants in other countries (which will all have to be operated at large capacity in order to secure cheap production), point to the indisputable fact that beyond the immediate future, there will have to be careful handling of what promises to be a very critical position. Hence the value of a central organization with resources for keeping in contact with movements throughout the world. At the same time, strenuous efforts will have to be made to develop home demand. In face of these conditions, if sulphuric acid makers desire to retain the custom of sulphate of ammonia makers, they will have to take steps to reduce their prices considerably, in order to enable the cheapening of the manufacturing costs of bye-product sulphate. The Chairman of the Sulphate of Ammonia Federation spoke of this in very plain terms at the last meeting.

The National Benzole Association have been kept busy during the year—owing to the reduced production from coke-ovens, the lowering of the price of petrol, and the need for keeping on a competitive basis. But there have been developments, particularly in the direction of putting on the market what is known as the "National Benzole Mixture." This motor-fuel consists of a fifty-fifty mixture of benzole and petrol.

One or two points of general interest regarding work that is being done on the secondary products of coal carbonization. A great deal more attention is being paid to the quality of coke. This product is benefiting from the policy in these times of many gas undertakings to buy high-class coals; and the condition in contracts as to a maximum percentage of inerts will assist in a yield of coke of reasonable ash content. Coke must be made as popular as possible; and this can only be effected through quality and fair price in relation to coal. A great deal of attention has been paid by investigators to the influence of structure upon combustibility. During the year Sir George Beilby, the Fuel Research Board, Messrs. E. R. Sutcliffe and E. C. Evans, and Dr. Roy Illingworth have made contributions to this subject. Other investigators had previously got into touch with the same subject. Messrs. Sutcliffe and Evans have been following the line of pre-briquetting coal and coke breeze (without binders), and carbonizing in internally heated retorts. The pre-briquetting, it is claimed, puts the material in such a condition that it comes out of the retorts or ovens as a dense hard coke. The coke is said to be as ignitable, and to have as good burning properties, as the coke of low-temperature carbonization with its greater percentage of volatile matter. High-temperature carbonization is the practice in Messrs. Sutcliffe and Evans' process, as also in the experimental work of Dr. Roy Illingworth, who claims that, without pre-briquetting, he can make any fuel up to zero volatile which will burn freely. Much attention has been devoted during the year to tar dehydration and distillation—particularly for small works. Concerning sulphate of ammonia, Messrs. H. D. Greenwood and H. J. Hodsman, of the Department of Coal Gas and Fuel Industries at the Leeds University, have been giving us more information on the factors influencing the ammonia yield in the carbonization of coal. At the meeting of the Institution of Gas Engineers, too, Mr. A. C. Monkhouse and Prof. J. W. Cobb contributed a paper on the liberation of nitrogen and sulphur from coal and coke. The economies of sulphate of ammonia production were dealt with in a paper by Mr. P. Parrish at the annual meeting of the Society of Chemical Industry. He pointed to courses by which the efficiency of the process might be raised—one being by reducing the cost of the steam. In the annual report of the Chief Inspector under the Alkali Works Regulation Act (Dr. T. Lewis Bailey), there was much of interest and value on the subjects of spent oxide and sulphuric acid, and the disposal of effluent liquors.

COMMERCIAL POINTS.

The first editorial article published in the "JOURNAL" this year, began with the words: "There is a feeling of confidence in the country that the current year is going to be better than the past one. The industrial and trade prophets tell us so; and we hope they are right." It is always dangerous to prophesy. During the year there was the great engineering lock-out; and this very substantially hindered revival and developments. Moreover, industries generally, while showing more vigour, did so very gradually; and the result is that we close the year with an improvement in industry, but still a long way behind pre-war standards of activity. There remains much to be made up, which will, however, be helped by the easier conditions of money, the reduction of income-tax by 1s., and the promise that industry is to have a period of rest in which to recuperate without any addition to burdens. This, we think, will apply even to the proposal of unemployment insurance within industries; for the new Prime Minister has said that such a scheme could only be applied in normal times. These times cannot be called normal. Statutory companies and public utility undertakings have also received immunity for another three years from the Corporation Tax.

The year 1921 was full of complications for the gas industry, chief among them being the coal strike, the results of which were felt far into the current year. Combined with this fact, in industrial gas-supply areas the position of manufacturing requirements for gas and coke has had a depressing effect upon trading. But there has been some compensation during the year—particularly in residential areas—in that the atmospheric conditions have been the opposites of those of 1921, especially in the period that hardly deserved the name of summer. This, to an extent, helped gas to recover the reductions of consumption incurred in the summer months of 1921, and to put on something representing progress in business. Some benefit in trading capacity has been obtained from the lowering of the prices of coal, oil, and railway rates; and of the markets for secondary products, there cannot be any great complaint, having regard to the circumstances of the year—excepting in regard to coke in some areas. As to the lightening of railway rates, the National Gas Council, the Society of British Gas Industries, and the Association of British Chemical Manufacturers did good work before the Railway Rates Advisory Committee, though industry generally and the Mining Association particularly do not think the Railway Companies have gone far enough yet in helping manufacture and the trade of the country to recover. In the first half of the year, some gas undertakings had so far experienced restoration from the financial shocks of 1921 as to be in a position to reduce the price of gas; and this assisted in giving a fillip to business. In the second half year, reductions became very general; and quite a good stride downwards was made by many concerns. The Gas Light and Coke Company and the Commercial Gas Companies are now at 10d. per therm; while the South Metropolitan Company is down to 9d. per therm. Wandsworth and Hornsey in the Metropolitan area are leading with that Company in

the matter of price. In a few fortunate cities and towns 6d. per therm is now being charged; and the Bath Gas Company will be down to 5½d. after the current reading of the meters.

A WAVE OF ENTHUSIASM IN THE SALES DEPARTMENT.

While the technical staffs inside gas-works are doing all they can to bring manufacturing economies to bear upon the fortunes of the industry, there has been a great burst of enthusiasm on the sales side of the business, which is fundamental through its methods to the maintenance and development of business, and thus of the gas industry generally. It is now commonly recognized that, in the gas industry, there is a technical side to all commercial effort; and therefore technical as well as trading efficiency is required of the men taking any part in gas sales. We have had a share in helping to create interest, to spread information, and to aid technical progress among the men in the sales department, by publishing a monthly supplement—"THE GAS SALESMAN." The success of this has given us both satisfaction and encouragement. We have also done a part in hastening the formation of salesmen's circles or conferences—a movement which was originally suggested by the British Commercial Gas Association, and has, during the latter part of the year, been developed by them with considerable success. The "B.C.G.A." has again rendered service to the industry, the value of which cannot be appraised; and this is largely due to the indomitable spirit of the Executive Chairman (Mr. F. W. Goodenough) and the energy of a staff loyal to the backbone. The therm agitation kept the Association busy—not so much through the newspapers as in other ways—one being by addresses by Mr. Goodenough before various bodies. The district conferences and the annual meeting at Bristol all had front-rank success. In short, everything the Association are doing is not only to the benefit of the gas industry, but is in the interests of the public at large.

Several papers were read before the junior gas associations on various topics connected with the sales department. These papers show two things particularly—that the standards of gas salesmanship and sales methods have been, and are being, raised, and that there is a large concentration now on developments in the applications of gas in which technical knowledge is requisite.

Gas undertakings and gas-appliance manufacturers have taken part in several highly successful exhibitions during the year; and there have been developments in this respect. One is that at the Ideal Home and the Woman's Exhibitions at Olympia, the London undertakings made a joint exhibit. A second is the new co-operation between furnishing firms and gas undertakings in attracting the interest of the public by properly equipped flats (as in the South Metropolitan Gas Company's area) and by bungalows, as illustrated at Croydon. Articles have recently appeared in our columns on these lines of co-operative propaganda.

GAS-USING APPLIANCES.

During the year there have been no notable inventions in connection with the applications of gas. But more attention is now being paid to artistic and more efficient lighting by means of gas. It has been recognized by the practitioners in this direction that there is scientific as well as unscientific lighting, and that the former scores. For outdoor purposes, and shop lighting, too, the advantages of grouped small units (with preheating) have been more largely recognized and applied. There has also been a revival in the application of high-pressure lighting, which during the war and subsequently was left somewhat in abeyance in respect of development until things got into an easier state. Dr. Carpenter raised much interest in the lighting question by a paper at the annual meeting of the Institution of Gas Engineers, in which he pleaded for the adoption of higher ideals in connection with gas lighting. He showed that the lighting load can be preserved, if there is a renunciation of the old rule-of-thumb methods, and the rules of scientific application are regarded. Some time ago, a Joint Committee of the British Commercial Gas Association and of the Society of British Gas Industries were set up to consider what steps should be taken to standardize the essential parts of burners, to eliminate shoddy burners, mantles, fittings, &c., from the market, and generally to maintain and develop gas lighting. There should be an interesting report from them.

During the year the third report of the Committee on the Lighting of Factories was issued. While admitting that the report would be useful as a guide in some respect, there were other points upon which, from the side of the gas industry, it was necessary to pass some strictures. The Committee treated gas and electric lighting as though they, in their physical attributes, had an equality—that, in fine, the intrinsic brilliancies of the two forms of lighting were the same. We are afraid that, generally speaking, the inquiry has only produced negative results; the Committee themselves arriving at the conclusion that there can at present be no enforcement of legal minima of illumination for industrial purposes.

Also touching lighting, there has been much controversy respecting the application of a duty on imported glassware and mantles for lighting. Some urged freedom in trade, and others that it was only fair to home makers that, at all events for a period, they should be protected from foreign competition. This could only have the effect of strengthening the development of their wartime efforts—then under difficulties—in establishing the home industries. Dr. Carpenter, the Chairman of the Gas Companies' Protection Association, was strongly in favour of an import duty especially upon glassware. The upshot in that respect was the imposition of a duty of 33⅓ p.ct. *ad valorem*, to continue until 1924. The mantle question was much more seriously contested; but, without going into details, it may be said that the British manufacturers, before a Committee appointed under Part II. of the Safeguarding of Industries Act, established their case for a duty being imposed; and the Board of Trade made an Order applying to mantles manufactured in Germany, or component parts thereof, whether finished or not, a duty of 33⅓ p.ct. *ad valorem*. British mantles have since been reduced in price, and so have German mantles—the manufacturers in Germany apparently being prepared to go to any length to prevent the survival of the mantle industry in this country, The gas industry cannot afford—the war proved it—to let Germany have a monopoly in this country of an essential to the gas-lighting business.

Turning to other applications of gas, the tendency of the times on the sales side of the industry to the application and utilization of higher technical knowledge and system has produced closer attention to the use of appliances suitable to requirement, with the view to secure the highest thermal efficiencies. When this is done, one gets into contact with the highest economy; and this is the route to the satisfaction of the consumers, and to serving the best interests of the industry. An important event was the issue by the National Gas Council of the report of a Committee appointed by them on the standardization of gas-cookers, together with a specification. Tenders are now under consideration for patterns and jigs and sample cookers. In connection with cookers, the modern hotplate is now a far more efficient arrangement. The open-type grills, in place of continuous bars, prevent a large amount of heat being carried away by conduction, and allow the free play of the flames upon the utensils above. The burners, too, have been raised in efficiency. There have been no striking developments in gas-fires; but probably these will come under the scrutiny of the Standardization Committee, as well as other appliances, inasmuch as, at the request of the National Gas Council, the Committee have been continued in existence for the purpose of carrying their explorations into other fields of application than that already dealt with. Water-heating by gas, steam-raising by gas for small industrial purposes, bakers' gas ovens, and gas power, are among the many other subjects of application that have been treated upon during the year.

It may be conveniently mentioned here that early in the year the Joint Committee of the Institution of Gas Engineers and the Society of British Gas Industries issued the revised specification for new standard sizes of dry meters, which applied from January last. A fresh nomenclature has been applied, and the description of meters by "lights" is no longer fashionable. The uses of gas have long since made inconsistent that method of distinguishing meter capacity.

SMOKE ABATEMENT.

Relating to gas uses is the problem of smoke abatement. It has been very much to the fore during the year. There have been several papers and discussions on the subject. It has been written about in the newspapers and in the magazines. It has been heard of in Parliament and in the London

County Council. And the fogs of November emphasized the importance of the question from the economic and health standpoints. The seventh report of the Advisory Committee on Air Pollution was issued by the Meteorological Office; and it showed that the domestic coal grate is responsible for the greater part of the mischief. In fact, by the method of testing impurity in the atmosphere invented by Dr. J. S. Owens, it has been determined that in London some four-fifths of the pollution is caused by domestic coal grates. The interest of the gas industry grows. Sir Napier Shaw, in an article in "The Times," suggested that there should be encouragement to householders to alter their ways by reducing the rateable assessment of houses that made no smoke, compared with those that pollute the atmosphere. This would lead to fearful muddles. The late Government introduced a Bill which, notwithstanding all the information now available, did not in any respect touch the question of the contribution of dwelling-houses to the insanitary conditions of the atmosphere, but merely proposed to make more stringent the conditions and penalties applying to factory chimneys. Of course, we do not believe that the source of so much mischief can be altered by revolutionary enactment; but something is required to set the work in motion, so that a progressive change can be achieved at faster rate than can be accomplished by the endeavours of the gas industry in spreading the use of gas for heating. Nobody seemed to find satisfaction in the Bill. Lord Newton, who presided over the Smoke Abatement and Noxious Vapours Committee, did not think it would be a very effective instrument in furthering the recommendations they made in their report; manufacturers generally were opposed to its provisions; and at least one of the chemical organizations has given vent to an adverse opinion on the Bill. The Bill is not likely to be revived in its old form by the new Government; they are going to consider the introduction of a fresh measure. We hope it will be something of a more constructive character, and not merely a measure further to penalize manufacturers, though it is not denied that there is much room in industry for a more rational utilization of fuel, which will produce greater efficiency and economy. One way of doing this is by the greater utilization of coke for steam-raising, and the employment of gas for other heating operations, and (where suitable) cheap gas under boilers—say of the surface combustion type, which system gives a very high efficiency.

RENEWED CARBON MONOXIDE ATTACK.

Notwithstanding the very thorough inquiry that was made by a Departmental Committee into the question of whether or not it was desirable to restrict the proportion of carbon monoxide in town gas used for domestic purposes, and the decision of the Committee that no such restriction was necessary, a newspaper campaign was revived early in the year. Letters were sent to the papers, and newspaper editors took up the subject rather liberally, and certainly very foolishly. A singular thing was that immediately after the resuscitation of the subject, the number of suicides by gas increased in a manner that was unpleasant to the gas industry, although it was in no wise blameable. There were cases, too, in which gross carelessness in neglecting escapes of gas was shown to be the cause of fatalities. The revival of the campaign and the temporary increase of suicides appeared to point to a relation between the two. A further curious feature is that, although during the war, and during the great coal strike, considerable percentages of water gas were being sent out in admixture with coal gas, practically nothing was heard of trouble. Furthermore, the newspaper campaign having died down, the cases of suicide by town gas have noticeably diminished.

By the time this fresh attack on the gas industry over the question of carbon monoxide was started, supply undertakings had quite restored their methods of manufacture to those which obtained prior to the war, or prior to the great coal strike. This being so, generally speaking, the proportion of carbon monoxide in town gas had been brought well below the 20 p.ct. which Dr. Haldane had suggested might be allowed in town supply. Nevertheless, newspaper correspondents, and the newspapers themselves, indicated to the general public that some wonderful change had taken place in the character of the gas supplied to the public, and due to this the proportion of carbon monoxide had largely increased, which was altogether contrary to facts. Moreover, even some of the leading newspapers seemed to confuse the percentage of water gas with the percentage of carbon monoxide in the total mixture. It was all very strange to the technical man to read the balderdash on the subject that appeared in these "educators" of public opinion.

Some striking figures were given by the Governor of the Gas Light and Coke Company (Mr. D. Milne Watson) at the annual meeting of the proprietors. He pointed out that fatalities due to gas did not exceed 2 per annum per million of the population, while those due to railways numbered some 22 per annum per million of the population, and those due to street accidents in London reached to as much as 100 per annum per million of the population. This is a point over which those stumble who are antagonistic to the gas industry regarding this question of the carbon monoxide content of town gas. They do not like in this connection the guarantee of relative safety which statistics of fatalities from town-gas poisoning supply, as these refuse to support the plea for restriction. At the meeting of the South Metropolitan Gas Company, Dr. Carpenter also pointed out that statistics had proved that the fears of wholesale troubles arising from the presence of carbon monoxide in town gas were—at any rate so far as Great Britain was concerned—totally unfounded. He also mentioned that carbon monoxide is distributed far and wide in the streets from the exhaust pipes of motor vehicles; and he made a point when he remarked that gas is made, distributed, and bought to be burned, and not breathed. The advice which Mr. E. V. Evans gave to the newspapers in a lecture at the Society of Arts was likewise appropriate. He urged them to retain a sound and balanced conception on the question of risk from carbon monoxide. About this time the Board of Trade issued a Special Order which provided that no gas undertakers, as defined by the Gas Regulation Act of 1920, should supply any gas for domestic purposes containing carbon monoxide unless such gas possessed the distinctive smell of coal gas. The Public Control Committee of the London County Council made an investigation into the subject of carbon monoxide in London gas from the year 1912; and this brought out the significant fact that, with only one exception, the proportion during the whole of those years had not exceeded 20 p.ct., which was the figure advised by Dr. Haldane. That exception, too, was away back in the year 1912, in the case of the Commercial Gas Company. Generally speaking, the figures varied from 11 or 12 p.ct. up to 19 p.ct. in different years in the cases of the Gas Light and Coke Company and the Commercial Gas Company; while in that of the South Metropolitan Company it was between 6·8 and 9·6 p.ct. It may also be noted that the Board of Trade are now being informed as to fatalities attributable to gas poisoning; the reports to the Board being made by the Medical Officers of Health.

THE GAS REGULATION ACT.

Throughout the year, week by week, the Director of Gas Administration maintained a steady issue of Orders under section 1 of the Gas Regulation Act; and the applications continue to flow in. So far, the supply of applications has been such that the Board have not exercised the power conferred upon them to impose the therm system on statutory undertakings that hang back from application. Local authorities seem to be the most reluctant ones in coming under the new system. Several gas companies this year increased their declared calorific power, finding that, with their present-day plant equipment, they were supplying a needlessly high margin. Moreover, the price of oil has been reduced; and as more than a therm is yielded per gallon of oil, and a little oil is useful as a protection to the distribution system and the gas-meters on consumers' premises, the combined circumstances were favourable to a moderate stepping-up in the declared value. What will happen later on with further plant changes, cannot be predicted from this change of policy under existing plant and other conditions. During the parliamentary session, there was a hint that the basic-price system—the invention of the South Metropolitan Gas Company, which has been adopted by various important concerns—would be the subject of further investigation; but nothing towards bringing this about has yet transpired. A number of Special Orders has been issued under section 10 of the Gas Regulation Act.

The Gas Referees have not yet specified definitely and for general use a recording calorimeter; but an important event was the publication of the patent specification of Prof. C. V. Boys' recording and integrating calorimeter;

and subsequently, at the annual meeting of the Institution of Gas Engineers, the inventor gave a detailed description of the instrument. One is being introduced into a testing-station, under the care of a Gas Examiner, so that now practical daily experience of its working will be obtained. The Referees also published a provisional prescription applying to the Brentford Gas Company the Fairweather continuous recorder. The Board of Trade issued directions as to the steps to be taken in making appeals from the reports of gas examiners. The advent of the therm in Field's Analysis was a feature of this publication; and the therm figures declare, among other things, that all comparisons nowadays on the 1000 c.ft. basis are misleading. The therm is the only reliable one.

THE THERM AND HIGH GAS ACCOUNTS.

The second attack the gas industry had to encounter during the year had reference to the question of high gas accounts, for which the therm was declared the culprit. Early in the year, occasional letters appeared in the newspapers calling attention to the system of charging by the therm, and asserting that consumers did not understand the newcomer, and were under the impression that the system affected their gas accounts on the wrong side, as compared with the old system of charging by cubic feet. A curious thing was that, though the gas-meter from its infantile days has been accused of being a fraudulent instrument (officially tested and stamped though it is), and though the major part of the consumers could not read their meters, nor could define a cubic foot, the love for the gas-meter and the cubic foot of those who complained suddenly knew no bounds.

The ball having been set rolling, the "Pall Mall Gazette" and the "Daily Mail" took up the matter, and diligently applied themselves to keeping it on the move. Through their assistance, additional momentum was gained; and after the June accounts had been rendered, quite a shoal of correspondence appeared in the newspapers complaining of high gas accounts. The therm was accused of being at the bottom of the trouble. Our electrical friends took advantage of the opportunity for pegging-in a few letters regarding the merits of electricity; but in this we do not think they did themselves much (if any) good. A curious thing about the complaints of high gas accounts was that some of them showed as much as 100 p.ct. and more increase on the corresponding period of 1921. The newspapers, in their ignorance of the facts of the case, took these examples as being representative of the whole; whereas, considering the number of consumers, they were exceptional, rather than representative. As a matter of fact, an analysis of the accounts of various gas undertakings proved that, though under the therm system some accounts had ascended, others had actually decreased, while others still showed nothing but a normal increase. If anything, the June quarter of this year ought to have exhibited a great increase in gas accounts compared with the June quarter of 1921, seeing that the latter was a period of high atmospheric temperatures, while the June quarter of this year was in part cold and frequently wet. Well into the month of April, consumers were using gas-fires morning and evening, and naturally, owing to the weather conditions, cooking and water heating were probably on a larger scale than during the torrid days of the June quarter last year. In that quarter many undertakings had a decrease of consumption. In the second quarter of this year, some of them recouped that decrease, and added a small percentage, which may be taken to represent a normal addition to their business, in view of the enlargement of the number of customers and connections. The actual percentage increase being at such a low level was proof positive that the therm system had not universally raised gas accounts to anything that matched the sum of the individual accounts of the relatively few consumers who complained; and, therefore, their complaints could not represent a universal condition of things under the operation of the therm system. The "Daily Mail" described the action of the therm as "mysterious;" and this paper and certain others clamoured for an inquiry into its wickedness in acting contrary to the interests of the consumers, while its very birth was intended to guarantee them that they obtained delivery of heating value equivalent to the price they paid for the gas.

Even while this agitation was proceeding, gas undertakings were emerging from the financial troubles brought upon them by the coal strike, and the other irregular conditions that obtained in 1921. Plant renovations, extensions, &c., were evidently bringing about advantageous effects, while the lowering of the prices of coal and oil was also producing benefit in respect of manufacturing costs. In the circumstances, the price of gas was reduced per therm by many gas undertakings. The agitation for an inquiry still continued. The September quarter came round, and then it was found that accounts showed a reduction compared with the September quarter of last year. Still the "Daily Mail," in its profound knowledge of these matters, referred to this recession of gas accounts as being as "mysterious" as the raising of them in the June quarter. The fact that the reduction of the price of the therm would produce this condition was apparently beyond the comprehension of our morning contemporary. Moreover, there is no doubt that the agitation had some good effect in inducing consumers to pay, as the gas industry desires them to do, more attention to economy in gas use. The very facility of gas use is something which needs to be guarded by care, inasmuch as facility of use is something which can easily lead consumers into extravagance. The therm system, in short, had less to do with the raising of gas accounts in the June quarter than had the consumers themselves.

Regarding the clamour for an inquiry into the operation of the therm system, the National Gas Council made it known that, although they saw no necessity for such an investigation, they would not oppose it, but would render any assistance for the purpose of convincing the public by evidence that the system was not at fault, but that any blame for high gas accounts would have to be searched for elsewhere. Pressure was brought to bear on the London County Council; and the Public Control Committee considered the matter, and recommended the Council to urge the Board of Trade to hold an inquiry—and this notwithstanding that the Council themselves, as large consumers of gas, had nothing whatever of which to complain respecting their accounts under the therm system in comparison with those under the cubic feet system. Ultimately, after the General Election, the new President of the Board of Trade (Sir Philip Lloyd-Greame) agreed to appoint a Committee, and this was done early in December. The members are: Sir Clarendon Golding Hyde (Chairman), Mr. Arthur Balfour, J.P., Sir James Martin, J.P., Mr. A. A. Pugh, Mr. W. J. U. Woolcock, C.B.E., with Mr. W. H. L. Patterson as Secretary. The Board of Trade had, in making selection, apparently taken good care to have the members absolutely impartial, for none of them is connected with the gas industry, nor with the London County Council. They were merely instructed to inquire into the working of the therm system of charging for gas; and they commenced their sittings on Tuesday, Dec. 12. So no time was lost.

THE INQUIRY MAKES PROGRESS.

So far as the proceedings have gone, the evidence has not in any way affected the status of the therm as the basis of charge for gas. The Board of Trade, the Gas Referees, the Board of Fuel Research are all favourable to it, from the point of view that it is a positively definite basis, and is in the interests of the gas consumers. The London County Council, who petitioned for the inquiry, owing to the receipt of some seventy letters of complaint, also confess that an inquiry at 100 of their schools has brought no evidence that the therm has been guilty of promoting an increase in the consumption of gas; and the Sheffield Gas Consumers' Association are also agreed that the therm is a more reliable basis of charge than volume. The letters of complaint may have been accompanied by the signatures of a few hundred consumers. But what is that number compared with the total of 1,400,000 consumers in the area of the three London Companies? It is easy enough to get consumers of anything to agree that the price is too high, and to sign a petition, if they think there is a chance of getting the price lowered. However, it was only last week that comment was made upon the proceedings; and therefore it is unnecessary to enlarge upon them in this retrospect—particularly as the investigation is still pending. But strong representations are being made that some standard prices under the Gas Regulation Act are, in view of changed circumstances, somewhat too high, and that they should be revised. Even the Sheffield Gas Consumers' Association make this point, albeit the Sheffield Company have the lowest basic (or standard) price per therm in the country—7d. It is also

urged—and the Committee appear to be impressed by this—that gas accounts should show cubic feet as well as therm consumption and charge, so that consumers can the better (if capable) check their accounts.

IN PARLIAMENT.

Year by year the gas legislative work which comes before the Private Bill Authorities and Parliament is being reduced. This is not due to any lack of technical and commercial progress in the gas industry, but is simply attributable to the fact that during the war it was impossible to proceed with works' developments, and with maintenance to any adequate degree. Before things had righted themselves, the Gas Regulation Act had been passed, which gave the gas industry power under section 10 to apply for Special Orders through the Board of Trade, under which Orders it is possible to get practically as large a measure of fresh authorization as by the more cumbersome method of applying for powers through the agency of a Bill.

Last session, however, a few Bills were promoted which dealt with gas. There was that of the Sheffield Gas Company. A feature of this measure was that the Company proposed to come under the basic principle of price and dividend, as introduced by the South Metropolitan Gas Company, in lieu of the sliding-scale; and they originally asked that the basic price should be 9d. per therm. Prior to the Bill coming before a Committee, the Company had consented to a reduction of the basic price to 8d.; and after the opening of the proceedings, they agreed to shed another 1d.—making the basic price only 7d., which is far and away the lowest in the country. The Windsor Gas Company also asked for a basic price; but in their case the Unopposed Bills Committee decided that determination of the amount of the basic price should be referred to the Board of Trade for the decision of the Director of Gas Administration (Mr. H. C. Honey). There were indications during the session that the principle of the basic price and dividend is to be subject to investigation. When the Chester Bill was before the Unopposed Bills Committee of the House of Lords, Earl Donoughmore incidentally mentioned that the principle had not yet been finally decided, and had to be discussed. No movement has yet been made to this end. The Stretford and District Joint Board secured the powers they sought under the purchase clause inserted in the Manchester Corporation Gas Act of 1921; and thus the Stretford Gas Company's undertaking did not remain very long in the possession of the Manchester Corporation. Another notable Act was that of the Stoke-on-Trent Corporation, which empowered the transfer, by agreement, of the Potteries station of the British Gas Light Company. This transfer has already taken place. Regarding the coming session, the promise of Gas Bills is very light, and among them is very little that is notewo[illegible]cy.

Reverting to last [illegible]sion, the Electricity Supply Bill which supplements the principal Act passed in 1919, became an Act. There was [illegible] opposition from the gas industry to certain of the po[illegible] as was also the case with the South Wales Electrical Po[illegible] Distribution Bill. In these matters, the industry was re[illegible]sented very largely by the National Gas Council; and the Gas Companies' Protection Association also took part. There were several objections; but the main ones were in respect of the financial powers to be granted. Local authorities in the areas of Joint Authorities (or in the case of South Wales in the area of the Power Company) received sanction to subscribe to the authorities or the Company, as the case might be, funds for capital purposes; but nothing could be more financially unsound than to allow local authorities to borrow money on the security of the rates, with the object of lending it to another body over whom, and over whose proceedings, they have no more effective control than that of one unit among many. Naturally, gas undertakings, being large ratepayers in every district, are strongly opposed to this form of speculation, and the commitment of the rates to obligations that appertain not only to their particular area, but to large districts beyond, and, moreover, for the purpose of benefiting an agent competing with themselves for the custom of the community.

ON THE WORKS AND ELSEWHERE.

It cannot be said that there has been any remarkable new invention this year in connection with carbonization; but the efforts of those interested in total gasification appear to be increasing. The gas industry for the time being is, through its circumstances, largely following the lines of least resistance, and is proceeding with development by adopting the well-known methods with the modern auxiliaries for securing with them the greatest efficiency. At the same time, complete gasification as a supplement to the ordinary plant is making headway. In our descriptions of works extensions during the year, continuous vertical retort plants of all types have taken precedence, with the best knowledge packed into them for regulating temperatures as the physical qualities of the coal require, and for securing by steaming, and by the utilization of waste-heat boilers, the best possible efficiency. We will not mention by name any of the installations, as this would necessitate quite a substantial list. The "JOURNAL" indexes for the year will guide to information concerning them. Mr. Thomas Glover, of Norwich, and Mr. Thomas Carmichael, of Portsmouth, have shown the economy to be effected by the utilization of modern carbonizing plant, compared with the old. The polemical question as to the use of Durham coal in continuous verticals was much discussed at the Southern Association meeting; and the balance of opinion appeared to be that Durham coal, while it can be carbonized in such retorts with suitable temperatures, requires the dust to be removed from it, and even then the throughput is reduced compared with other types of coal from other areas. But Durham coal is not without its defenders among continuous vertical retort users. At the same time, horizontal retorts still have good advocacy; and among their users to-day are found some of the suppliers of the cheapest gas. Experience in these matters submits that it does not do to be too dogmatic; but, on the whole, as between continuous vertical retorts and horizontal ones, the largest amount of testimony as to economy and efficiency rests with the continuous vertical retorts. Increasing the rate of carbonization was the subject of a paper read by Dr. Geoffrey Weyman before the Institution of Gas Engineers; and it forms an excellent contribution to carbonization literature.

Some new complete gasification plants have received description in the course of the year; and a large amount of interest has for various reasons been taken in low-temperature carbonization. One of them was the old one of the provision of solid smokeless fuel; but this is being challenged, as already stated, by greater consideration being given to the structure of coke produced by high-temperature carbonization. Another interesting feature is the use of low-temperature plant for producing rich gas for utilization as an enricher of town gas in place of oil. The Board of Fuel Research has drawn attention to this matter; and Mr. Walter Chaney has made it the subject of special contributions to the "JOURNAL," but his conclusions and calculations have been challenged in our columns by Mr. George Evetts. A number of papers have been read on the general subject, particularly before the South Wales Institute of Mining Engineers.

Upon the subject of refractories, a great deal of attention continued to be bestowed in all directions. There was considerable regret at the meeting of the Institution of Gas Engineers to hear from Mr. A. E. Broadberry of the great disability under which the Refractory Materials Association are working, owing to inadequate financial support. This ought not to be, in view of the great importance of the subject from the economic point of view to all industries in which high temperatures are employed. Among other features of the year in connection with gas-works construction was the considerably enlarged use that is being made of reinforced concrete. Generally speaking, there is very little to be noticed in connection with other parts of the plant, with one or two exceptions. There has been revived interest, for instance, in the matter of liquid purification—one notable contribution to which appeared in our issue for Nov. 29.

The subject of water gas has also been fairly prominent, and particularly since gas oil was reduced in price to 5½d. per gallon. The official quotation to-day is 4½d. per gallon. But comparative figures have shown that, under present-day working, coal gas is being manufactured at a net price per therm somewhat lower than water gas. But a set-off against this, in many districts, is that the coke consumption for water-gas manufacture has had a favourable effect on local coke values. This was particularly emphasized in the discussion on the paper by Mr. Carmichael, at the meeting of the Southern District Association of Gas Engineers and Managers. To the Société Technique du Gaz, M. Mallet

the matter of price. In a few fortunate cities and towns 6d. per therm is now being charged; and the Bath Gas Company will be down to 5½d. after the current reading of the meters.

A Wave of Enthusiasm in the Sales Department.

While the technical staffs inside gas-works are doing all they can to bring manufacturing economies to bear upon the fortunes of the industry, there has been a great burst of enthusiasm on the sales side of the business, which is fundamental through its methods to the maintenance and development of business, and thus of the gas industry generally. It is now commonly recognized that, in the gas industry, there is a technical side to all commercial effort; and therefore technical as well as trading efficiency is required of the men taking any part in gas sales. We have had a share in helping to create interest, to spread information, and to aid technical progress among the men in the sales department, by publishing a monthly supplement—"The Gas Salesman." The success of this has given us both satisfaction and encouragement. We have also done a part in hastening the formation of salesmen's circles or conferences—a movement which was originally suggested by the British Commercial Gas Association, and has, during the latter part of the year, been developed by them with considerable success. The "B C.G.A." has again rendered service to the industry, the value of which cannot be appraised; and this is largely due to the indomitable spirit of the Executive Chairman (Mr. F. W. Goodenough) and the energy of a staff loyal to the backbone. The therm agitation kept the Association busy—not so much through the newspapers as in other ways—one being by addresses by Mr. Goodenough before various bodies. The district conferences and the annual meeting at Bristol all had front-rank success. In short, everything the Association are doing is not only to the benefit of the gas industry, but is in the interests of the public at large.

Several papers were read before the junior gas associations on various topics connected with the sales department. These papers show two things particularly—that the standards of gas salesmanship and sales methods have been, and are being, raised, and that there is a large concentration now on developments in the applications of gas in which technical knowledge is requisite.

Gas undertakings and gas-appliance manufacturers have taken part in several highly successful exhibitions during the year; and there have been developments in this respect. One is that at the Ideal Home and the Woman's Exhibitions at Olympia, the London undertakings made a joint exhibit. A second is the new co-operation between furnishing firms and gas undertakings in attracting the interest of the public by properly equipped flats (as in the South Metropolitan Gas Company's area) and by bungalows, as illustrated at Croydon. Articles have recently appeared in our columns on these lines of co-operative propaganda.

Gas-Using Appliances.

During the year there have been no notable inventions in connection with the applications of gas. But more attention is now being paid to artistic and more efficient lighting by means of gas. It has been recognized by the practitioners in this direction that there is scientific as well as unscientific lighting, and that the former scores. For outdoor purposes, and shop lighting, too, the advantages of grouped small units (with preheating) have been more largely recognized and applied. There has also been a revival in the application of high-pressure lighting, which during the war and subsequently was left somewhat in abeyance in respect of development until things got into an easier state. Dr. Carpenter raised much interest in the lighting question by a paper at the annual meeting of the Institution of Gas Engineers, in which he pleaded for the adoption of higher ideals in connection with gas lighting. He showed that the lighting load can be preserved, if there is a renunciation of the old rule-of-thumb methods, and the rules of scientific application are regarded. Some time ago, a Joint Committee of the British Commercial Gas Association and of the Society of British Gas Industries were set up to consider what steps should be taken to standardize the essential parts of burners, to eliminate shoddy burners, mantles, fittings, &c., from the market, and generally to maintain and develop gas lighting. There should be an interesting report from them.

During the year the third report of the Committee on the Lighting of Factories was issued. While admitting that the report would be useful as a guide in some respect, there were other points upon which, from the side of the gas industry, it was necessary to pass some strictures. The Committee treated gas and electric lighting as though they, in their physical attributes, had an equality—that, in fine, the intrinsic brilliancies of the two forms of lighting were the same. We are afraid that, generally speaking, the inquiry has only produced negative results; the Committee themselves arriving at the conclusion that there can at present be no enforcement of legal minima of illumination for industrial purposes.

Also touching lighting, there has been much controversy respecting the application of a duty on imported glassware and mantles for lighting. Some urged freedom in trade, and others that it was only fair to home makers that, at all events for a period, they should be protected from foreign competition. This could only have the effect of strengthening the development of their wartime efforts—then under difficulties—in establishing the home industries. Dr. Carpenter, the Chairman of the Gas Companies' Protection Association, was strongly in favour of an import duty especially upon glassware. The upshot in that respect was the imposition of a duty of 33⅓ p.ct. *ad valorem*, to continue until 1924. The mantle question was much more seriously contested; but, without going into details, it may be said that the British manufacturers, before a Committee appointed under Part II. of the Safeguarding of Industries Act, established their case for a duty being imposed; and the Board of Trade made an Order applying to mantles manufactured in Germany, or component parts thereof, whether finished or not, a duty of 33⅓ p.ct. *ad valorem*. British mantles have since been reduced in price, and so have German mantles—the manufacturers in Germany apparently being prepared to go to any length to prevent the survival of the mantle industry in this country, The gas industry cannot afford—the war proved it—to let Germany have a monopoly in this country of an essential to the gas-lighting business.

Turning to other applications of gas, the tendency of the times on the sales side of the industry to the application and utilization of higher technical knowledge and system has produced closer attention to the use of appliances suitable to requirement, with the view to secure the highest thermal efficiencies. When this is done, one gets into contact with the highest economy; and this is the route to the satisfaction of the consumers, and to serving the best interests of the industry. An important event was the issue by the National Gas Council of the report of a Committee appointed by them on the standardization of gas-cookers, together with a specification. Tenders are now under consideration for patterns and jigs and sample cookers. In connection with cookers, the modern hotplate is now a far more efficient arrangement. The open-type grills, in place of continuous bars, prevent a large amount of heat being carried away by conduction, and allow the free play of the flames upon the utensils above. The burners, too, have been raised in efficiency. There have been no striking developments in gas-fires; but probably these will come under the scrutiny of the Standardization Committee, as well as other appliances, inasmuch as, at the request of the National Gas Council, the Committee have been continued in existence for the purpose of carrying their explorations into other fields of application than that already dealt with. Water-heating by gas, steam-raising by gas for small industrial purposes, bakers' gas ovens, and gas power, are among the many other subjects of application that have been treated upon during the year.

It may be conveniently mentioned here that early in the year the Joint Committee of the Institution of Gas Engineers and the Society of British Gas Industries issued the revised specification for new standard sizes of dry meters, which applied from January last. A fresh nomenclature has been applied, and the description of meters by "lights" is no longer fashionable. The uses of gas have long since made inconsistent that method of distinguishing meter capacity.

Smoke Abatement.

Relating to gas uses is the problem of smoke abatement. It has been very much to the fore during the year. There have been several papers and discussions on the subject. It has been written about in the newspapers and in the magazines. It has been heard of in Parliament and in the London

County Council. And the fogs of November emphasized the importance of the question from the economic and health standpoints. The seventh report of the Advisory Committee on Air Pollution was issued by the Meteorological Office; and it showed that the domestic coal grate is responsible for the greater part of the mischief. In fact, by the method of testing impurity in the atmosphere invented by Dr. J. S. Owens, it has been determined that in London some four-fifths of the pollution is caused by domestic coal grates. The interest of the gas industry grows. Sir Napier Shaw, in an article in "The Times," suggested that there should be encouragement to householders to alter their ways by reducing the rateable assessment of houses that made no smoke, compared with those that pollute the atmosphere. This would lead to fearful muddles. The late Government introduced a Bill which, notwithstanding all the information now available, did not in any respect touch the question of the contribution of dwelling-houses to the insanitary conditions of the atmosphere, but merely proposed to make more stringent the conditions and penalties applying to factory chimneys. Of course, we do not believe that the source of so much mischief can be altered by revolutionary enactment; but something is required to set the work in motion, so that a progressive change can be achieved at faster rate than can be accomplished by the endeavours of the gas industry in spreading the use of gas for heating. Nobody seemed to find satisfaction in the Bill. Lord Newton, who presided over the Smoke Abatement and Noxious Vapours Committee, did not think it would be a very effective instrument in furthering the recommendations they made in their report; manufacturers generally were opposed to its provisions; and at least one of the chemical organizations has given vent to an adverse opinion on the Bill. The Bill is not likely to be revived in its old form by the new Government; they are going to consider the introduction of a fresh measure. We hope it will be something of a more constructive character, and not merely a measure further to penalize manufacturers, though it is not denied that there is much room in industry for a more rational utilization of fuel, which will produce greater efficiency and economy. One way of doing this is by the greater utilization of coke for steam-raising, and the employment of gas for other heating operations, and (where suitable) cheap gas under boilers—say of the surface combustion type, which system gives a very high efficiency.

Renewed Carbon Monoxide Attack.

Notwithstanding the very thorough inquiry that was made by a Departmental Committee into the question of whether or not it was desirable to restrict the proportion of carbon monoxide in town gas used for domestic purposes, and the decision of the Committee that no such restriction was necessary, a newspaper campaign was revived early in the year. Letters were sent to the papers, and newspaper editors took up the subject rather liberally, and certainly very foolishly. A singular thing was that immediately after the resuscitation of the subject, the number of suicides by gas increased in a manner that was unpleasant to the gas industry, although it was in no wise blameable. There were cases, too, in which gross carelessness in neglecting escapes of gas was shown to be the cause of fatalities. The revival of the campaign and the temporary increase of suicides appeared to point to a relation between the two. A further curious feature is that, although during the war, and during the great coal strike, considerable percentages of water gas were being sent out in admixture with coal gas, practically nothing was heard of trouble. Furthermore, the newspaper campaign having died down, the cases of suicide by town gas have noticeably diminished.

By the time this fresh attack on the gas industry over the question of carbon monoxide was started, supply undertakings had quite restored their methods of manufacture to those which obtained prior to the war, or prior to the great coal strike. This being so, generally speaking, the proportion of carbon monoxide in town gas had been brought well below the 20 p.ct. which Dr. Haldane had suggested might be allowed in town supply. Nevertheless, newspaper correspondents, and the newspapers themselves, indicated to the general public that some wonderful change had taken place in the character of the gas supplied to the public, and due to this the proportion of carbon monoxide had largely increased, which was altogether contrary to facts. Moreover, even some of the leading newspapers seemed to confuse the percentage of water gas with the percentage of carbon monoxide in the total mixture. It was all very strange to the technical man to read the balderdash on the subject that appeared in these "educators" of public opinion.

Some striking figures were given by the Governor of the Gas Light and Coke Company (Mr. D. Milne Watson) at the annual meeting of the proprietors. He pointed out that fatalities due to gas did not exceed 2 per annum per million of the population, while those due to railways numbered some 22 per annum per million of the population, and those due to street accidents in London reached to as much as 100 per annum per million of the population. This is a point over which those stumble who are antagonistic to the gas industry regarding this question of the carbon monoxide content of town gas. They do not like in this connection the guarantee of relative safety which statistics of fatalities from town-gas poisoning supply, as these refuse to support the plea for restriction. At the meeting of the South Metropolitan Gas Company, Dr. Carpenter also pointed out that statistics had proved that the fears of wholesale troubles arising from the presence of carbon monoxide in town gas were—at any rate so far as Great Britain was concerned—totally unfounded. He also mentioned that carbon monoxide is distributed far and wide in the streets from the exhaust pipes of motor vehicles; and he made a point when he remarked that gas is made, distributed, and bought to be burned, and not breathed. The advice which Mr. E. V. Evans gave to the newspapers in a lecture at the Society of Arts was likewise appropriate. He urged them to retain a sound and balanced conception on the question of risk from carbon monoxide. About this time the Board of Trade issued a Special Order which provided that no gas undertakers, as defined by the Gas Regulation Act of 1920, should supply any gas for domestic purposes containing carbon monoxide unless such gas possessed the distinctive smell of coal gas. The Public Control Committee of the London County Council made an investigation into the subject of carbon monoxide in London gas from the year 1912; and this brought out the significant fact that, with only one exception, the proportion during the whole of those years had not exceeded 20 p.ct., which was the figure advised by Dr. Haldane. That exception, too, was away back in the year 1912, in the case of the Commercial Gas Company. Generally speaking, the figures varied from 11 or 12 p.ct. up to 19 p.ct. in different years in the cases of the Gas Light and Coke Company and the Commercial Gas Company; while in that of the South Metropolitan Company it was between 6·8 and 9·6 p.ct. It may also be noted that the Board of Trade are now being informed as to fatalities attributable to gas poisoning; the reports to the Board being made by the Medical Officers of Health.

The Gas Regulation Act.

Throughout the year, week by week, the Director of Gas Administration maintained a steady issue of Orders under section 1 of the Gas Regulation Act; and the applications continue to flow in. So far, the supply of applications has been such that the Board have not exercised the power conferred upon them to impose the therm system on statutory undertakings that hang back from application. Local authorities seem to be the most reluctant ones in coming under the new system. Several gas companies this year increased their declared calorific power, finding that, with their present-day plant equipment, they were supplying a needlessly high margin. Moreover, the price of oil has been reduced; and as more than a therm is yielded per gallon of oil, and a little oil is useful as a protection to the distribution system and the gas-meters on consumers' premises, the combined circumstances were favourable to a moderate stepping-up in the declared value. What will happen later on with further plant changes, cannot be predicted from this change of policy under existing plant and other conditions. During the parliamentary session, there was a hint that the basic-price system—the invention of the South Metropolitan Gas Company, which has been adopted by various important concerns—would be the subject of further investigation; but nothing towards bringing this about has yet transpired. A number of Special Orders has been issued under section 10 of the Gas Regulation Act.

The Gas Referees have not yet specified definitely and for general use a recording calorimeter; but an important event was the publication of the patent specification of Prof. C. V. Boys' recording and integrating calorimeter;

and subsequently, at the annual meeting of the Institution of Gas Engineers, the inventor gave a detailed description of the instrument. One is being introduced into a testing-station, under the care of a Gas Examiner, so that now practical daily experience of its working will be obtained. The Referees also published a provisional prescription applying to the Brentford Gas Company the Fairweather continuous recorder. The Board of Trade issued directions as to the steps to be taken in making appeals from the reports of gas examiners. The advent of the therm in Field's Analysis was a feature of this publication; and the therm figures declare, among other things, that all comparisons nowadays on the 1000 c.ft. basis are misleading. The therm is the only reliable one.

THE THERM AND HIGH GAS ACCOUNTS.

The second attack the gas industry had to encounter during the year had reference to the question of high gas accounts, for which the therm was declared the culprit. Early in the year, occasional letters appeared in the newspapers calling attention to the system of charging by the therm, and asserting that consumers did not understand the newcomer, and were under the impression that the system affected their gas accounts on the wrong side, as compared with the old system of charging by cubic feet. A curious thing was that, though the gas-meter from its infantile days has been accused of being a fraudulent instrument (officially tested and stamped though it is), and though the major part of the consumers could not read their meters, nor could define a cubic foot, the love for the gas-meter and the cubic foot of those who complained suddenly knew no bounds.

The ball having been set rolling, the "Pall Mall Gazette" and the "Daily Mail" took up the matter, and diligently applied themselves to keeping it on the move. Through their assistance, additional momentum was gained; and after the June accounts had been rendered, quite a shoal of correspondence appeared in the newspapers complaining of high gas accounts. The therm was accused of being at the bottom of the trouble. Our electrical friends took advantage of the opportunity for pegging-in a few letters regarding the merits of electricity; but in this we do not think they did themselves much (if any) good. A curious thing about the complaints of high gas accounts was that some of them showed as much as 100 p.ct. and more increase on the corresponding period of 1921. The newspapers, in their ignorance of the facts of the case, took these examples as being representative of the whole; whereas, considering the number of consumers, they were exceptional, rather than representative. As a matter of fact, an analysis of the accounts of various gas undertakings proved that, though under the therm system some accounts had ascended, others had actually decreased, while others still showed nothing but a normal increase. If anything, the June quarter of this year ought to have exhibited a great increase in gas accounts compared with the June quarter of 1921, seeing that the latter was a period of high atmospheric temperatures, while the June quarter of this year was in part cold and frequently wet. Well into the month of April, consumers were using gas-fires morning and evening, and naturally, owing to the weather conditions, cooking and water heating were probably on a larger scale than during the torrid days of the June quarter last year. In that quarter many undertakings had a decrease of consumption. In the second quarter of this year, some of them recouped that decrease, and added a small percentage, which may be taken to represent a normal addition to their business, in view of the enlargement of the number of customers and connections. The actual percentage increase being at such a low level was proof positive that the therm system had not universally raised gas accounts to anything that matched the sum of the individual accounts of the relatively few consumers who complained; and, therefore, their complaints could not represent a universal condition of things under the operation of the therm system. The "Daily Mail" described the action of the therm as "mysterious;" and this paper and certain others clamoured for an inquiry into its wickedness in acting contrary to the interests of the consumers, while its very birth was intended to guarantee them that they obtained delivery of heating value equivalent to the price they paid for the gas.

Even while this agitation was proceeding, gas undertakings were emerging from the financial troubles brought upon them by the coal strike, and the other irregular conditions that obtained in 1921. Plant renovations, extensions, &c., were evidently bringing about advantageous effects, while the lowering of the prices of coal and oil was also producing benefit in respect of manufacturing costs. In the circumstances, the price of gas was reduced per therm by many gas undertakings. The agitation for an inquiry still continued. The September quarter came round, and then it was found that accounts showed a reduction compared with the September quarter of last year. Still the "Daily Mail," in its profound knowledge of these matters, referred to this recession of gas accounts as being as "mysterious" as the raising of them in the June quarter. The fact that the reduction of the price of the therm would produce this condition was apparently beyond the comprehension of our morning contemporary. Moreover, there is no doubt that the agitation had some good effect in inducing consumers to pay, as the gas industry desires them to do, more attention to economy in gas use. The very facility of gas use is something which needs to be guarded by care, inasmuch as facility of use is something which can easily lead consumers into extravagance. The therm system, in short, had less to do with the raising of gas accounts in the June quarter than had the consumers themselves.

Regarding the clamour for an inquiry into the operation of the therm system, the National Gas Council made it known that, although they saw no necessity for such an investigation, they would not oppose it, but would render any assistance for the purpose of convincing the public by evidence that the system was not at fault, but that any blame for high gas accounts would have to be searched for elsewhere. Pressure was brought to bear on the London County Council; and the Public Control Committee considered the matter, and recommended the Council to urge the Board of Trade to hold an inquiry—and this notwithstanding that the Council themselves, as large consumers of gas, had nothing whatever of which to complain respecting their accounts under the therm system in comparison with those under the cubic feet system. Ultimately, after the General Election, the new President of the Board of Trade (Sir Philip Lloyd-Greame) agreed to appoint a Committee, and this was done early in December. The members are: Sir Clarendon Golding Hyde (Chairman), Mr. Arthur Balfour, J.P., Sir James Martin, J.P., Mr. A. A. Pugh, Mr. W. J. U. Woolcock, C.B.E., with Mr. W. H. L. Patterson as Secretary. The Board of Trade had, in making selection, apparently taken good care to have the members absolutely impartial, for none of them is connected with the gas industry, nor with the London County Council. They were merely instructed to inquire into the working of the therm system of charging for gas; and they commenced their sittings on Tuesday, Dec. 12. So no time was lost.

THE INQUIRY MAKES PROGRESS.

So far as the proceedings have gone, the evidence has not in any way affected the status of the therm as the basis of charge for gas. The Board of Trade, the Gas Referees, the Board of Fuel Research are all favourable to it, from the point of view that it is a positively definite basis, and is in the interests of the gas consumers. The London County Council, who petitioned for the inquiry, owing to the receipt of some seventy letters of complaint, also confess that an inquiry at 100 of their schools has brought no evidence that the therm has been guilty of promoting an increase in the consumption of gas; and the Sheffield Gas Consumers' Association are also agreed that the therm is a more reliable basis of charge than volume. The letters of complaint may have been accompanied by the signatures of a few hundred consumers. But what is that number compared with the total of 1,400,000 consumers in the area of the three London Companies? It is easy enough to get consumers of anything to agree that the price is too high, and to sign a petition, if they think there is a chance of getting the price lowered. However, it was only last week that comment was made upon the proceedings; and therefore it is unnecessary to enlarge upon them in this retrospect—particularly as the investigation is still pending. But strong representations are being made that some standard prices under the Gas Regulation Act are, in view of changed circumstances, somewhat too high, and that they should be revised. Even the Sheffield Gas Consumers' Association make this point, albeit the Sheffield Company have the lowest basic (or standard) price per therm in the country—7d. It is also

urged—and the Committee appear to be impressed by this—that gas accounts should show cubic feet as well as therm consumption and charge, so that consumers can the better (if capable) check their accounts.

IN PARLIAMENT.

Year by year the gas legislative work which comes before the Private Bill Authorities and Parliament is being reduced. This is not due to any lack of technical and commercial progress in the gas industry, but is simply attributable to the fact that during the war it was impossible to proceed with works' developments, and with maintenance to any adequate degree. Before things had righted themselves, the Gas Regulation Act had been passed, which gave the gas industry power under section 10 to apply for Special Orders through the Board of Trade, under which Orders it is possible to get practically as large a measure of fresh authorization as by the more cumbersome method of applying for powers through the agency of a Bill.

Last session, however, a few Bills were promoted which dealt with gas. There was that of the Sheffield Gas Company. A feature of this measure was that the Company proposed to come under the basic principle of price and dividend, as introduced by the South Metropolitan Gas Company, in lieu of the sliding-scale; and they originally asked that the basic price should be 9d. per therm. Prior to the Bill coming before a Committee, the Company had consented to a reduction of the basic price to 8d.; and after the opening of the proceedings, they agreed to shed another 1d.—making the basic price only 7d., which is far and away the lowest in the country. The Windsor Gas Company also asked for a basic price; but in their case the Unopposed Bills Committee decided that determination of the amount of the basic price should be referred to the Board of Trade for the decision of the Director of Gas Administration (Mr. H. C. Honey). There were indications during the session that the principle of the basic price and dividend is to be subject to investigation. When the Chester Bill was before the Unopposed Bills Committee of the House of Lords, Earl Donoughmore incidentally mentioned that the principle had not yet been finally decided, and had to be discussed. No movement has yet been made to this end. The Stretford and District Joint Board secured the powers they sought under the purchase clause inserted in the Manchester Corporation Gas Act of 1921; and thus the Stretford Gas Company's undertaking did not remain very long in the possession of the Manchester Corporation. Another notable Act was that of the Stoke-on-Trent Corporation, which empowered the transfer, by agreement, of the Potteries station of the British Gas Light Company. This transfer has already taken place. Regarding the coming session, the promise of Gas Bills is very light, and among them is very little that is noteworthy.

Reverting to last session, the Electricity Supply Bill which supplements the principal Act passed in 1919, became an Act. There was some opposition from the gas industry to certain of the powers, as was also the case with the South Wales Electrical Power Distribution Bill. In these matters, the industry was represented very largely by the National Gas Council; and the Gas Companies' Protection Association also took part. There were several objections; but the main ones were in respect of the financial powers to be granted. Local authorities in the areas of Joint Authorities (or in the case of South Wales in the area of the Power Company) received sanction to subscribe to the authorities or the Company, as the case might be, funds for capital purposes; but nothing could be more financially unsound than to allow local authorities to borrow money on the security of the rates, with the object of lending it to another body over whom, and over whose proceedings, they have no more effective control than that of one unit among many. Naturally, gas undertakings, being large ratepayers in every district, are strongly opposed to this form of speculation, and the commitment of the rates to obligations that appertain not only to their particular area, but to large districts beyond, and, moreover, for the purpose of benefiting an agent competing with themselves for the custom of the community.

ON THE WORKS AND ELSEWHERE.

It cannot be said that there has been any remarkable new invention this year in connection with carbonization; but the efforts of those interested in total gasification appear to be increasing. The gas industry for the time being is, through its circumstances, largely following the lines of least resistance, and is proceeding with development by adopting the well-known methods with the modern auxiliaries for securing with them the greatest efficiency. At the same time, complete gasification as a supplement to the ordinary plant is making headway. In our descriptions of works extensions during the year, continuous vertical retort plants of all types have taken precedence, with the best knowledge packed into them for regulating temperatures as the physical qualities of the coal require, and for securing by steaming, and by the utilization of waste-heat boilers, the best possible efficiency. We will not mention by name any of the installations, as this would necessitate quite a substantial list. The "JOURNAL" indexes for the year will guide to information concerning them. Mr. Thomas Glover, of Norwich, and Mr. Thomas Carmichael, of Portsmouth, have shown the economy to be effected by the utilization of modern carbonizing plant, compared with the old. The polemical question as to the use of Durham coal in continuous verticals was much discussed at the Southern Association meeting; and the balance of opinion appeared to be that Durham coal, while it can be carbonized in such retorts with suitable temperatures, requires the dust to be removed from it, and even then the throughput is reduced compared with other types of coal from other areas. But Durham coal is not without its defenders among continuous vertical retort users. At the same time, horizontal retorts still have good advocacy; and among their users to-day are found some of the suppliers of the cheapest gas. Experience in these matters submits that it does not do to be too dogmatic; but, on the whole, as between continuous vertical retorts and horizontal ones, the largest amount of testimony as to economy and efficiency rests with the continuous vertical retorts. Increasing the rate of carbonization was the subject of a paper read by Dr. Geoffrey Weyman before the Institution of Gas Engineers; and it forms an excellent contribution to carbonization literature.

Some new complete gasification plants have received description in the course of the year; and a large amount of interest has for various reasons been taken in low-temperature carbonization. One of them was the old one of the provision of solid smokeless fuel; but this is being challenged, as already stated, by greater consideration being given to the structure of coke produced by high-temperature carbonization. Another interesting feature is the use of low-temperature plant for producing rich gas for utilization as an enricher of town gas in place of oil. The Board of Fuel Research has drawn attention to this matter; and Mr. Walter Chaney has made it the subject of special contributions to the "JOURNAL," but his conclusions and calculations have been challenged in our columns by Mr. George Evetts. A number of papers have been read on the general subject, particularly before the South Wales Institute of Mining Engineers.

Upon the subject of refractories, a great deal of attention continued to be bestowed in all directions. There was considerable regret at the meeting of the Institution of Gas Engineers to hear from Mr. A. E. Broadberry of the great disability under which the Refractory Materials Association are working, owing to inadequate financial support. This ought not to be, in view of the great importance of the subject from the economic point of view to all industries in which high temperatures are employed. Among other features of the year in connection with gas-works construction was the considerably enlarged use that is being made of reinforced concrete. Generally speaking, there is very little to be noticed in connection with other parts of the plant, with one or two exceptions. There has been revived interest, for instance, in the matter of liquid purification—one notable contribution to which appeared in our issue for Nov. 29.

The subject of water gas has also been fairly prominent, and particularly since gas oil was reduced in price to 5¼d. per gallon. The official quotation to-day is 4½d. per gallon. But comparative figures have shown that, under present-day working, coal gas is being manufactured at a net price per therm somewhat lower than water gas. But a set-off against this, in many districts, is that the coke consumption for water-gas manufacture has had a favourable effect on local coke values. This was particularly emphasized in the discussion on the paper by Mr. Carmichael, at the meeting of the Southern District Association of Gas Engineers and Managers. To the Société Technique du Gaz, M. Mallet

described a process whereby oil gas is catalytically produced. It showed that good results are obtained by the process; and these results were subsequently confirmed in a special article to the "JOURNAL" by M. Coune, whose personal experience has been derived from a plant at the Forest Gas-Works (Brussels) of the Imperial Continental Gas Association. A very valuable report on the subject of carburetted water-gas plant, with waste-heat boiler, was presented by the Gas Investigation Committee at the meeting of the Institution of Gas Engineers.

Large gasholders have had considerable prominence during the year. The tendency to-day is towards the construction of holders of much greater capacity than formerly. Of course, the East Greenwich superholder was the forerunner of those that have in later years been constructed in America and elsewhere. America is going ahead particularly rapidly in respect of these gigantic structures. We noticed during the year an additional 15 million cubic feet holder at the Astoria Gas-Works, the Engineer for which was the late Mr. W. H. Bradley. Baltimore has a 10 million cubic feet holder. Of the same capacity are two in New York, and one in Chicago. A good engineering contribution to our pages was the description, with several drawings, of the 12½ million cubic feet gasholder for Sydney. This was from the pen of Mr. R. J. Milbourne, of Messrs. C. & W. Walker. A striking photograph that we were enabled to publish, through the courtesy of the Chairman of the South Metropolitan Gas Company (Dr. Charles Carpenter) and Messrs. Clayton, Son, & Co., disclosed the extent of the wrecking of the large gasholder at East Greenwich by the Silvertown explosion in 1917. A description was given of the damage occasioned, which showed the considerable amount of heavy work that had to be undertaken to restore the holder to working condition. [See "JOURNAL" for May 24 last.] A 7-million cubic feet spiral-guided holder is now being constructed at Belfast, to the designs and plans of Mr. J. D. Smith, Engineer and Manager of the Gas Department; the contractors being Messrs. R. & J. Dempster, Ltd. Another interesting feature has been the paper on "Tankless Gasholders," read by M. Bonnet at the last annual meeting of the Société Technique du Gaz. From this it appears that the use on the Continent of tankless holders in increasing sizes is making headway.

A proposed prospective development is a high-pressure coke-oven gas distribution scheme for East Kent; and information regarding this was published in our columns. The subject of the internal corrosion of gas plant owing to modern gas-works practice, was one of the subjects introduced at the meeting of the Institution of Gas Engineers in the report of the Life of Gas-Meters Joint Committee. In conjunction with this, Mr. J. G. Taplay, the Chemist to the Committee, gave a very favourable account of the large-scale experiment, at the Bow Common works of the Gas Light and Coke Company, with the chalk process for the removal of hydrocyanic acid from gas. We ought not to leave the subject of gas-works plant without referring to the excellent and informative paper which Mr. W. B. Leech contributed to the proceedings of the Institution on the subject of "Reconstruction at Beckton."

Respecting the complaint that was made last year at a meeting of the Society of British Gas Industries, concerning sanctions for loans being held-up, it transpired that Sir Arthur Duckham, the late President of the Society, had taken up the matter at the Ministry of Health. The authorities assured him that they had done all they could to expedite loans, but that the procedure was somewhat involved, and undoubtedly work had been held-up on account of the investigations concerning the questions of inerts and carbon monoxide in town gas. But there was promise that everything should be done to accelerate the issue of sanctions, so that work might be taken in hand as quickly as possible. In view of current lower costs for materials and labour, the point has lately been made that now is an exceptionally good time for gas undertakings to proceed with renewal and extension work.

THE ORGANIZATIONS OF THE INDUSTRY.

It is impossible here to enter into the mass of detail that constitutes the year's work of the organizations of the industry. Much of it has been incidentally referred to in the course of what has already been written. The National Gas Council (with Mr. D. Milne Watson as President) have continued their indispensable services to the industry; and in many matters, too, the Gas Companies' Protection Association, with Dr. Charles Carpenter as Chairman, have been very active in watching over the affairs of private gas enterprise.

Under the presidency of Mr. Thomas Hardie, the Institution of Gas Engineers held their annual meeting, which was packed with interest. It was the pleasure of the members to receive and to entertain a large representation of their *confrères* of the Société Technique du Gaz; and a right good and interesting time was spent. The hospitality of the Gas Light and Coke Company at Beckton particularly should be mentioned. But there were visits elsewhere—to the East Greenwich works of the South Metropolitan Company, to the Fuel Research Station, and to various places of national interest in the Metropolis. The reports and papers at the meeting showed the continued fertility of the technical side of the industry in the production of important problems, and their claims to investigation. They also indicated the progress that is being made in applying science to the work of gas production, distribution, and utilization. In the presidential chair of the Institution, Mr. Hardie has been succeeded by Mr. J. D. Smith, of Belfast.

Allusion has already been made, in the references to trading topics, to the work of the British Commercial Gas Association. The Society of British Gas Industries is an inseparable part of the organization of the gas industry; and the Council and members take a studious interest in all co-operative work for its advancement. The meetings during the year—held under the presidency of Lord Riddell, or the Chairman of Council (Alderman George Clark) in the first instance, and then of his successor, Mr. Albert Cliff, have been full of attraction. In his presidential address, Lord Riddell spoke of the necessity for the procedure affecting Private Bill legislation undergoing reform. There is a good deal of confidence among the members as to an early improvement in trade generally, which should result in more activity in their own works. As already said, with present prices of money, materials, and labour, there should be an immediate revival of work. In the "Bulletin" of the Society, Alderman Fred. J. West gave an account of his impressions of the value of the concentration of American gas organization, and founded on it a plea for a better consolidation of British gas organizations.

The Junior Gas Associations of the industry have to their credit a large amount of good work; and their place in the activities of the industry—a place that is highly important in respect of the technical training and education of the younger professional men—should, it is claimed (and we cannot refrain from endorsing the claim), receive still greater recognition. With satisfaction it is learned that several gas undertakings are now defraying the expenses of their assistants who attend the meetings of the various Associations. The Society of Chemical Industry, at their annual meeting, provided several topics of interest to the members of the gas profession. Under the auspices of the Institution of Civil Engineers, an Engineering Joint Council has been formed. The National Association of Technical Gas Officials have suspended operations for a time. The Chairman (Mr. R. G. Shadbolt) and the Committee tried hard to secure a greater interest in the work, but were unsuccessful. They still hope for better things.

EDUCATIONAL.

It is an easy step from the activities of our organizations to educational work for the training of young men for the gas industry. We cannot refer to this without at once acknowledging the success with which the functions of the Coal Gas and Fuel Department at the Leeds University are being performed—all to the advantage of the gas-supply and cognate industries. In his annual report, Prof. J. W. Cobb, the Livesey Professor, was able to announce an increase in the number of men taking the special courses at Leeds, which means that the laboratories of late have been fully occupied through this and the pushing-out into new research work. It is a very favourable sign of the times. We welcome it, and hope to see an extension of the resources of the department. Some provision is being made for this through the experimental gas plant which is being erected to the memory of Sir Corbet Woodall. This was originally begun through the munificence of Mr. Henry Woodall; and lately the Gas Light and Coke Company have contributed 500 guineas to the same purpose. To the excellence of the research work that is carried on by the

Department, the reports of the Gas Investigation Committee presented yearly to the Institution of Gas Engineers bear witness. The newest line of investigation is in connection with the operations of the National Benzole Association. Of course, other educational institutions are also accomplishing excellent work; but with the Leeds University, naturally the gas industry has strong ties.

Quite recently the scheme for the education, training, and examination of men for the gas profession has been published. This is work that has been carried out by a Special Committee of the Institution of Gas Engineers, in collaboration with the Board of Education. An article by Mr. Walter Hole appeared in our columns which gave a plain exposition of the scheme, and did much to enable full appreciation to be made of the difficulties that had had to be faced by those who had to consider its devising, and of the merits of the plans submitted for approval. The general impression is that only experience can improve upon the scheme in detail; the main lines being quite sound. The scheme will come before a special meeting of the members of the Institution in February; but inasmuch as it has been considered by the members of the various District Associations, and has received so much hearty endorsement, it is believed that it will be fully accepted in February. If so, then the scheme will be put into operation before next season comes round. All educational institutions where aspirants for the gas profession are training will have to fall into line, in order that the examination certificates to be issued under the scheme may be gained by the students.

LABOUR.

We will not attempt to review all that happened during the year in connection with labour. There have been large and far-reaching struggles to maintain high wages beyond the limits which industry can now afford. There was the great lock-out in the engineering trade, over an attempt by the Trade Unions—the A.E.U. taking the lead—to break down the right of employers to exercise without interference complete managerial functions in their establishments. The effort did not succeed. The stoppage, however, was long and disastrous—not only to work in this country, and to the securing of contracts abroad, but to the participants themselves, through the exhaustion of funds and the financial impoverishment of the members. Through the policy of their leaders during the last two years, some of the unions have lost much of their hold on the rank-and-file; and membership and revenue have consequently suffered considerable losses, with several unions heavily in debt.

In the gas industry, the wages sliding-scale has been operating smoothly, though the Gas Employers' Federation and the National Joint Industrial Council for the Gas Industry had to consider some amount of dissatisfaction that existed among gas workers in connection with the last agreement. There were conferences and negotiations, which resulted in a modification of the agreement, to this effect: Where the average of the cost of living figures for a three months' period was above 86, the slide was to continue in operation; but when, and as long as, the average cost of living figure was below 86, wages should be adjusted upwards or downwards at the rate of ½d. per hour, *plus* the 12½ p.ct. thereon for each full seven points, in lieu of the six points mentioned in the previous agreement. It was also decided that no three months' notice should be given by either side under the agreement until March, 1923.

THE RISE IN GAS STOCKS.

We cannot omit mention in this review of the substantial response that the gas stock market has made to the rehabilitation of the financial circumstances of the gas industry by the Gas Regulation Act, supplemented by better conditions of working, all of which have assisted in the restoration of dividends either to pre-war level or approximately so. The amounts by which prices per cent. have ascended vary considerably, but all well-established companies can point to excellent recoveries. Differences in value between the beginning of January and recently range from a few pounds up to between 50 and 60. This is excellent; and the proprietors will be grateful to the year and the Act and other causes that have effected this. Gas shares have also in large measure recovered their values; and this condition of things applies not only to home shares and stocks, but to those of British companies operating abroad. Money, too, is now much easier. The Bank rate was 5 p.ct. at the beginning of the year; it has since stepped down to 3 p.ct.

OFFICIAL CHANGES.

In the course of the year, there was a large number of changes in the personnel of official life in the gas industry. We cannot in a retrospect note them all; but perhaps we should mention the retirement of Mr. Thomas Goulden from the Chief Engineership of the Gas Light and Coke Company, and his elevation to the Court of Directors. His retirement from the Chief Engineership brought about the expected—the ascent of Mr. Thomas Hardie to the premier official position in the gas profession. Another resignation was that of Mr. G. M. Gill from the Chief Engineership of the South Metropolitan Gas Company; and he is now concerned in consulting practice. Mr. A. E. Broadberry has retired from the long-held office of Engineer and General Manager of the Tottenham Light, Heat, and Power Company; and he is now a member of the Board. Mr. W. E. Price, the Hon. Secretary of the Institution of Gas Engineers, resigned the office of Engineer and Manager of the Hampton Court Gas Company, and was appointed Managing Director of the Company. Another friend, Mr. Robert W. Wilson, after fifty years' service in the Imperial Continental Gas Association, resigned the Secretaryship, and was succeeded by Mr. F. H. James, M.A., with Mr. W. E. Bowers as Assistant Secretary. Mr. Wilson is now a member of the Board of the Association. We also learned that Prof. Arthur Smithells has decided to retire at the end of this year from University work, and intends to devote himself to the further elucidation of some of those problems with which his name in the scientific world is so closely and deservedly identified. Leeds University will miss him. It has already been predicted that it will not seem like the same place without him.

TO THE GREAT BEYOND.

The year to brought many in the gas industry days of mourning. Quite a large number of men who have led active lives in the industry have passed to the Great Beyond. There have, regretfully we have to say, been so many that we cannot here record all their names. Men who have been outstanding in the work of the industry have passed from our midst. That veteran to whom the gas industry owes so much for great practical work—Mr. John West—was called away. Mr. Isaac Carr also left the scene of his many activities. Mr. C. E. Jones is no longer with us. The veteran American Gas Engineer, and Chief Official of the Consolidated Gas Company of New York—Mr. W. H. Bradley—passed to his final rest. The Rt. Hon. Sir Daniel Ford Goddard is no more with us. We know, from the general sympathy which reached us from the home gas industry and from friends overseas, that we shall be pardoned a reference to the great loss we ourselves sustained by the death of our late Chairman and formerly sole proprietor of the "JOURNAL"—Mr. Walter King. From among the manufacturers passed Mr. Thomas Glover, of Alder and Mackay, Ltd, and previously of Thomas Glover & Co., Ltd., and R. & A. Main, Ltd.

THE FUTURE.

We must not prophesy. But looking at all the circumstances of the past year—which has been a year of restoration of conditions in certain respects, and partially so in others—with the great enthusiasm that exists on both the technical and commercial sides of the industry, and the manifest growth of a broader policy in the administration of the affairs of the industry combined with the indications of improved trade, we think it may be justly and safely said that there is at hand a period of considerable development for the gas industry. This is an opinion based solely on the survey of existing conditions; but we firmly believe there will be materialization. In the prosperity, whatever its measure, all associated with the industry will and must participate. With these feelings, we sincerely wish all in the industry—

HEALTH, HAPPINESS, AND PROSPERITY IN THE COMING YEAR.

Mr. William Alfred Surridge has accepted a seat on the Board of Directors of the Tottenham District Light, Heat, and Power Company.

Gas Workers' Wages.

In the three months from September to November, the cost of living index figures, as published in the "Labour Gazette," were 78, 80, and 81—an average of 79·33. As this does not represent a fall of seven points below the basis figure of 86, there will be no alteration in wages, which will remain the same for the next three months.

Dangers of Overhead Electric Wires.

Storms and overhead wires for electricity supply are not friendly; and they are very dangerous. The newspapers report that Allan Heyes, aged 12, of Bacup, last Wednesday night, became entangled in telephone wires brought down by the storm, and which came into contact with the overhead lighting wires. He received a shock of 230 volts. Artificial respiration was tried; but death took place soon afterwards. An Accrington message states that Elsie Redhead, aged 15, of Waterfoot, was electrocuted through coming into contact with electric wires which had fallen under the weight of snow. Her legs were entangled in two live wires which supply current for lighting purposes. A coal dealer who tried to liberate her body received a severe shock. Artificial respiration was tried without success. Underground electric wires are much to be preferred.

Therms at Fivepence-Halfpenny.

In our news columns to-day, we record that the Directors of the Bath Gas Light and Coke Company have decided, as from the reading of the meters at the end of this month, to reduce the price of gas to 5½d. per therm. Upon this we heartily congratulate both the Directors and the Engineer and Manager (Mr. J. Wesley Whimster). There is no certainty about it on our part, but this price per therm seems to us to be the lowest that we have yet encountered; and we should like to know whether any other gas managements can lay claim to equality or anything below. There are some fortunate undertakings that are charging in the neighbourhood of 2s. 6d. per 1000 c.ft.; but we cannot say how this works-out per therm. However, our electrical friends will be interested to ascertain how they stand in relation to these low prices per therm. A little calculation will shown them that Bath will be supplying potential heat energy to the amount of 18,180 B.Th.U. for a penny. Further, while Bath will be charging 5½d. for 100,000 B.Th.U., electricity suppliers would have to deliver 29 units of electricity to put into the possession of the consumers 100,000 B.Th.U., which 29 units at 1d. would cost 2s. 5d.

The L.C.C. and the Therm.

Apparently some of the members of the London County Council are not satisfied with the Public Control Committee's action regarding the therm. Before the Departmental Committee, representatives of the Council stated, on the part of the Council, there was no objection to the therm as the basis of gas charge, and there was no reason to attribute the increase of gas bills to the change that had been made. It is thought by Mr. W. C. Johnson and others that the Council had been misled and placed in an undignified position by the Public Control Committee, who acted merely in response to the newspaper outcry, for which they knew there was little justification, and had thus caused money to be spent needlessly on a Departmental Committee. That is a view we have taken all along. But, in his reply, Mr. Cyril Jacobs stated that the Committee had pressed for an inquiry—not only because of the Press agitation, but because the Council had received thousands of letters from different channels complaining of the charges for gas. In evidence before the Departmental Committee, one official of the Council stated that the number of letters received was seventy. There is a big difference between "seventy" and "thousands." Someone has surely blundered. Who is it?

Bro. JAMES EADINGTON, Manager of the Blyth Gas Company, was on the 20th inst. installed as Worshipful Master of the Blaydon Lodge (No. 659), Blyth, Northumberland. He was supported by about 150 brethren, and the proceedings were of high Masonic order, being followed by a banquet.

THE RETIREMENT OF PROF. SMITHELLS.

Appreciation of His Work by the Leeds University Court.

The retirement of Prof. Arthur Smithells, F.R.S., from the Professorship of Chemistry at Leeds University (which was announced in the "JOURNAL" for Nov. 1, p. 287), was referred to by the Pro-Chancellor (Mr. E. G. Arnold) at the last meeting of the Leeds University Court.

The PRO-CHANCELLOR remarked that Prof. Smithells had been prominently associated with the University in the public mind over a very long period, and had seen many stones and bricks laid into the permanent edifice. They would not let him go without expressing their great appreciation of his work and of their sense of loss on his departure. Prof. Smithells came to them in the day of small things; and what the place would be without him, he did not know.

The VICE-CHANCELLOR then moved the following resolution:

The Court, on hearing of Prof. Smithells' decision to resign the Professorship of Chemistry at the end of this session, in order to devote himself to scientific investigation in London, records its profound gratitude to him for service of immeasurable value to the University during the 37 years in which he has held his Professorship. He is one of the founders of the University, which owes more than it can ever express to his unselfish devotion to the public interest, to his untiring labours in the application of science to industry, to his strenuous and at last victorious defence of the recognition of scientific technology as an element in the highest type of University education, and to his undeviating adherence to a high and exacting standard in University studies. The Court rejoices to think that he now hopes to escape from some of the administrative cares which have eaten into the leisure which otherwise he would have devoted to scientific research, and assures him that his name and work will be inseparably connected in future with the history of the rise of the University of Leeds.

"Whoever in the future," said the Vice-Chancellor, "writes the history of modern universities, will record his work; and not only will they mention his educational services, but they will be drawn to quote from his writings on the educational problems which have confronted us. He writes about education with the clearness, grace, and naturalness which come from long experience and ripe thought, and which often recall to his readers the writings of John Henry Newman."

ELECTRICITY SUPPLY MEMORANDA.

Those Therms.

THE therm, over which men in the electricity supply industry have chuckled (some have actually been known to call it a "dodge"), is coming out of the inquiry by the Departmental Committee strengthened by the microscopical examination to which it has been subjected. The London County Council representatives could not find anything to say against it as a system of charging. The Sheffield Gas Consumers' Association regard it as quite a healthy method of charging for gas. The Board of Trade are favourable to it. The Gas Referees—Prof. C. V. Boys, F.R.S., Mr. W. J. Atkinson Butterfield, and Dr. J. S. Haldane, F.R.S.—support it as being the preferable method of charging. The Board of Fuel Research—Sir George Beilby, the Director, and Dr. Lander, the Assistant Director—know of nothing better as a basis of charge. To judge of this matter, has any electrical man qualifications higher than those of the Gas Referees or the Director and Assistant Director of Fuel Research, or of the Director of Gas Administration at the Board of Trade, Mr. H. C. Honey? Those who are competent to judge are of one mind; some of those who are not competent to judge disagree with them! And so we go on. The Departmental Committee were even told that it is much easier to define a therm than to define an electrical unit; and the witness who said this was not transgressing the truth. However, the therm is here, is getting day by day more firmly established, and has unquestionably come to stay. But there are electrical men who do not like it. It brings a means of true comparison uncomfortably near their own doors in respect of cooking and all heating operations—a means of comparison which the public will get to know more and more about. And another unpleasant fact is that while electrical cooking and heating charges per unit have not much (if any) margin to sacrifice, the therm price is slipping down in many places to quite low figures. As stated elsewhere, the Bath Gas Company are about to supply at 5½d. per therm; and there are other places selling at 6d. and thereabouts. Of course, gas-works near the coalfields, or having some other advantage which enables a low price, are in these times very fortunate. Those electricians who are interested in comparisons will find interest in working-out how much potential heat energy is supplied for one penny the gas way with 100,000 B.Th.U. sold at 5½d. or 6d.; and they will somewhat sorrowfully contrast the answer with the 3420 B.Th.U. of the electrical unit. Another interesting arithmetical exercise would be: If 18,180 B.Th.U. can be purchased for a penny with gas at 5½d. per therm, what would be the efficiency of a gas-fire that delivered only about 3000 B.Th.U. usefully into a room? Of course, the answer would not reveal anything but an absurdity, inasmuch as the modern gas-fire can easily take credit for 75 p.ct. efficiency—50 p.ct. radiant heat, and about 25 p.ct. convected.

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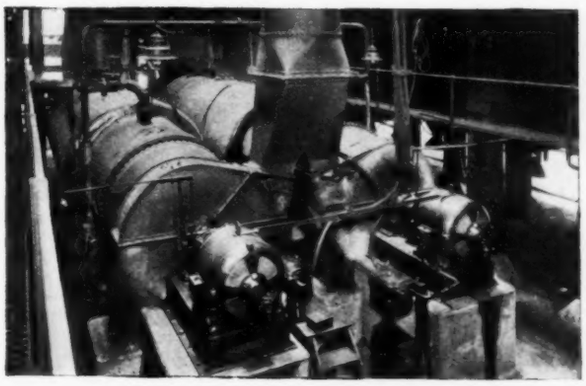

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A Big Saving.

London electricity consumers will rejoice and be glad—if they believe in prophecies and estimates. These sometimes go astray. They have often done so in connection with electricity schemes; and electricity undertakings, which before their birth have had predicted for them substantial profits, have only produced deficits. However, there is a bigger thing in hand now. It is the unification of all the electricity supply companies and authorities in London and the suburbs. "Electrical Industries" has published the news. According to our contemporary, a draft Order embodying the scheme will be submitted to Parliament next session. The Electricity Commissioners "expect the unification of electrical generating and distributing facilities will involve an annual saving in London of approximately £1,000,000—a reduction of about 15 p.ct. on the cost of the present consumption." A million pounds sterling is a nice round sum; but it will be noted that the cautious Commissioners only "expect" this. Our contemporary does not give its authority for the statement; it publishes it, however, not as a rumour, but with a definiteness that suggests inner knowledge.

Comparisons.

The same paper professes to know much about the commercial enterprise of the gas industry. Points that it makes regarding this will be read with amusement by gas men; and if they are thin-skinned, other things it says may hurt their feelings. Anyway, we rather think that the electrical people are a little bit nervous regarding the activities of the gas industry in pushing business. We are told that during the discussion on Mr. Gillott's paper on the domestic load—a paper to which reference has already been made in the "Memoranda"—several speakers alluded to the probable counter activities of gas undertakings as soon as the electricity industry becomes really busy on cooking and heating. Of course, the gas industry will. As a matter of fact, it has been very busy in these directions, excepting during the difficult war times, for many years past; and the men of the electricity industry would not think much of its competitor if it did not respond to increased electrical activity with greater activity on its own part. However, we are obliged to the speakers concerned for the recognition that it has no inert competitor with which to deal. In fact, at the meeting the warning was given that the gas industry would fight with increasing vigour and tenacity. Apparently the speakers who expressed these views have a very good knowledge of the energy that the gas industry can bring to bear upon its work, though we confess that not all gas undertakings are the same in this respect. But "Electrical Industries" would like to damp the ardour of the gas industry. In a feeble way, it says: "In this connection we may note that the gas industry did its best to retain the lighting business—and failed." This has been said before. The person who wrote it is ignorant on this particular subject. Will he tell us how it is that the gas industry, after daylight fails, is to-day selling more gas (despite the economy-producing incandescent burner compared with flat-flame ones) than it was doing twenty years ago? If he cannot give a satisfactory answer, then let him curb his facility for writing what is not true on this point. The gas industry has not only retained a large part of its old lighting load, but it has gained correspondingly to its loss, and something more. Pretence in material affairs always was, and always will be, very silly. However, our contemporary does acknowledge that the gas industry is better organized for competition than in the days when experts disputed over the relative lighting costs of gas and electricity; but so is the electricity industry. This we do not deny. However, the following tit-bit of meretricious writing will cause a little laughter in one quarter; and perhaps will spur it up to show that appearance, efficiency, and effect are in its case quite synonymous: "The British Commercial Gas Association may appear to be as formidable as the German Army before the war; but its practical efficiency either in offence or in defence is probably not so great in reality as in appearance." Further, we find that "much of the strength of the 'B.C.G.A.' comes from the support of the London Gas Companies. These are extraordinarily active and well managed; but the general run of gas undertakings up and down the country are not models of progressiveness any more than are the electricity supply undertakings." We wish our friend had instanced by name a few of the undertakings in the "general run." It would have put a little more piquancy into his statement.

Some of our Methods Revealed.

We are loth to leave this delightful revelation of ourselves; and so we will dip a little deeper into what is written. It seems that we have an "essential weakness" in our position; and the most striking proof of it lies in the abnormal means adopted to strengthen it. An instance of this is said to be that gas companies are now advertising that 5000 medical men use modern gas-fires; but they do not advertise the process by which these authorities on hygiene were induced to instal gas-fires.

> A fair notion of the process may be gathered from the enterprise now on foot to induce consulting engineers to follow the medical men. Modern gas-fires are offered free of all cost on trial for a month, with the option to buy, hire, or return. Existing gas-fires in the offices of consultants will be put in order free of charge—this attention being repeated annually. The gas company is also ready to fix, free of charge, gas appliances for water-heating, lighting, cooking, or other purposes. This invasion of Victoria Street is an obvious preliminary to advertisements about 500 leading consultants using gas-fires.

Now the gas industry knows by what means—at any rate, one of the means—it is making such substantial headway in its heating and cooking business. But supposing it is all true, there would be nothing about it of which to be ashamed. It is fair enterprise. And what is more, it shows that, from the point of view of economy, efficiency, cleanliness, and convenience, the gas industry has no objection to incurring expense to have their appliances put to the most critical test. But our friend apparently considers such methods, if or where they obtain, as rather contemptible. They are "bolstering tactics," adopted in order to "cajole" people into using gas apparatus. But if successful, why not? But the short-sighted writer says: "The gas companies would never descend into such practices if they were really sure of the merits of their product." It is because they have confidence that they can, or could, do these things. If the free-fixed appliances had not merit, does anyone who is not suffering from doltishness suppose that people would continue to use them, seeing that they would have to pay for the fuel consumed and the inefficiency? Our friend should incorporate a little logic in his writings on this subject of the propaganda work of the gas industry.

Prodigality.

Talking of propaganda methods, we see that the Wimbledon Electrical Engineer thinks it advisable to hold an electrical exhibition. His Committee and the Council are of the same mind. So one is to be held in March next; and it is to continue ten days or a fortnight. But a sum not exceeding £100 is to be spent! This must mean that the manufacturers are to pay; and the electrical manufacturers are beginning to smart under the continual exhibition strains upon them, which, when the harvest is reaped, are not convincing as to profitableness. However, some of them are to have a reward from Wimbledon; for the Council have agreed to authorize the electrical engineer to spend a sum not exceeding £200 on electric cooking stoves to be let out on hire. £200! Prodigious!

High Installation Costs.

This is a perennial subject of interest. It stands at the very gateway to progress in adopting of electrical operation. There has been discussion upon it in a paper read by Messrs. W. J. Revell and F. T. Alldread before the National Association of Supervising Electricians. It is pointed out that the factors affecting installation costs are as follows: (1) Design of materials and lay-out of installation; (2) prices of manufactured materials and apparatus; (3) labour costs; (4) establishment or overhead charges; (5) contractors' profits. The authors criticized the proneness of engineers to hold slavishly to one system of wiring; and their idea is that there should be selection of the cheaper methods which would be durable under the conditions to be encountered—in other words, in order to reduce costs, all methods should be eliminated which are not necessary to ensure good distribution and freedom from danger. If there were compliance with this rule, then, in view of "the conditions to be encountered," the most reliable systems—the systems "free" from danger—should be put into working-class houses, and the least expensive ones into the houses of people of high refinement and intellectual capacity. As to the prices of materials, the authors call attention to the fact that these are in the hands of powerful rings and combines; and they question the necessity for these. The costs of labour are the most speculative; but the authors suggest that they could be lowered by forethought on the part of the supervisor. The foreman must be the right man on the right job. As to overhead or establishment charges, much could be done in the matter of curtailment by running a proper workshop and making effective use of showrooms. In the opinion of the authors, manufacturers should only deal with contractors, and not with the public direct. The profit thus made by the contractors would help in lowering the costs of installations. Simpler apparatus would, in the opinion of the President (Mr. W. E. Highfield), help to diminish the expense. Another speaker suggested that too much protection in installations is insisted upon by the supply authorities; and this helps to raise the costs. There seem so many separate factors contributing to the high cost of electrical installation that it will be a matter of difficulty to get them all to contribute to the reduction of initial expenditure.

British Cast-Iron Research Association.—During the past month arrangements have been made by the Research Department for the early prosecution of definite and systematic research on some of the fundamental properties of cast iron. The range of irons to be examined in the first place will include the full run of commercial grey irons and semi-steels.

Lignite Char Experiments.—In the course of tests made at Pittsburg, by the United States Bureau of Mines, lignite char has been found to burn to a gas containing a higher proportion of carbon monoxide than that from coke. To determine if this relatively high CO content with lignite char is to be attributed to the smaller size of the char, coke of the same size as the char will be burned on the next tests.

XUM

NATIONAL GAS COUNCIL.

Meeting of the Central Executive Board.

A Meeting of the Central Executive Board of the National Gas Council was held on the 13th inst., at No. 30, Grosvenor Gardens, S.W.—Mr. D. MILNE WATSON in the chair.

THERM INQUIRY.

The first day's evidence given before the Departmental Committee appointed by the Board of Trade "to inquire and report as to the method of charging for gas on a thermal basis" was discussed. It was reported that the Emergency Committee of the Council had met on Friday, Dec. 8, to consider the procedure of the Council in regard to submitting evidence, as it was understood that the Departmental Committee would call for evidence from the three largest Metropolitan Companies, from Provincial Companies, and from Ratepayers' Organizations. The Emergency Committee, after carefully considering the position, recommended to the Central Executive Board certain witnesses to give evidence on behalf of the National Gas Council.

In the ensuing discussion, it transpired that a large number of gas undertakings which had adopted the thermal system showed on their accounts the conversion from cubic feet into therms; and it was considered that this was a very desirable course to adopt, at any rate until the thermal system was thoroughly grasped by the consumers.

The Chairman gave a brief history of the agitation against the thermal system, so far as London was concerned.

RAILWAY CLASSIFICATION OF COAL.

It was reported that the Mining Association had written to the Federation of British Industries against the proposal to include in one class all coal, coke, and patent fuel; and they proposed to request the Rates Advisory Committee to review their decision and to separate coal from coke, and coal for shipment from coal transported inland. It was further reported that a meeting was to be held that afternoon of the Federation of British Industries and the Mining Association, and that it was most important that the gas industry should be represented. The Board nominated Mr. A. W. Smith, of the Birmingham Gas Department (or his deputy), and Mr. Ogilvie to attend this meeting.

STANDARD COOKERS.

The report was submitted of the Gas Appliances Specification Committee of the Council, with regard to tenders for patterns and jigs, &c., for the Council's standard cookers. It was announced that, after careful consideration, the Committee unanimously recommended the acceptance of the tender of the Parkinson Stove Company, Ltd. Further recommendations of the Committee in question were submitted and approved by the Board. It is hoped that by about the middle of next year a certain number of sample cookers will be available for those gas undertakings who desire to purchase the same for inspection and testing.

A vote of thanks was passed to all those representatives who had rendered assistance in this work.

SOUTH WALES ELECTRICAL POWER DISTRIBUTION COMPANY ACT, 1922.

The first application to the Ministry of Health for a "Consent" under the Act was reported to have been made by a local authority in South Wales. This matter was deferred in order that the South Wales District Executive Board should have an opportunity of considering the position.

CORPORATION PROFITS TAX—ANCILLARY BUSINESSES.

It was reported that a meeting of the Federation of British Industries had been called on the 8th inst., with regard to the action of the Inland Revenue authorities in seeking to levy the above tax on profits arising from such of the activities of public utility companies as cannot be said to be ancillary to their main business. It was pointed out that the gas industry was under statutory limitations, not only with regard to the price of gas, but also as to the dividends they might pay. This differentiated the industry from other trades, and placed them in a very strong position. Counsel's opinion had been taken by the Federation of British Industries; and in view of possible trouble, it was resolved that the Council should carefully watch this question.

SPECIFICATION FOR ROAD TAR.

Conferences with the Ministry of Transport with regard to the proposed revised road tar specification were reported. The revised draft specification was expected to be ready about the middle of January. With regard to bitumen *versus* tar for road purposes, the Council were making inquiries, and would report at a later date.

BRITISH ENGINEERING STANDARDS ASSOCIATION.

It was reported that this Association had asked the Council to appoint a permanent representative on the Committee which was being reconstituted to deal with the question of a revised specification for cast-iron pipes for gas, water, and sewage. It was also suggested that the Board should appoint a Committee to meet representatives of other bodies in the industry in order to arrive at joint recommendations, if possible, for the amendment of the present specification. A Committee was elected accordingly, with power to nominate a representative to serve on the British Engineering Standards Sub-Committee.

REDUCTION IN RAILWAY RATES FOR COAL IN THE IRON AND STEEL TRADES, AND NOT FOR THE GAS INDUSTRY.

It was reported that a protest had been forwarded by the Council to the Railway Clearing House against the exclusion of the gas industry from the concessions in connection with railway rates granted to the iron and steel trades on the carriage of coal, coke, &c.; and a strong resolution supporting such protest was passed by the Board.

STANDARD TERMS AND CONDITIONS OF CARRIAGE OF COAL, COKE, &c.

It was reported that the present draft proposals of the traders in connection with this matter were not entirely satisfactory, and that the Council had drawn the attention of the Federation of British Industries to this fact. The Federation of British Industries suggested that the gas industry should be represented upon the Committee dealing with the matter. The Central Executive Board nominated Mr. S. S. Ogilvie to serve on this Committee.

FACTORY AND WORKSHOPS ACT—CHEMICAL REGULATIONS, 1922.

An interview was reported between the Managers of the Council and the Deputy Chief Inspector of Factories at the Home Office, on behalf of a number of small undertakings throughout the country, for exemption from the above regulations. It was resolved that the Council's District Secretaries should be asked to invite small undertakings in their district to communicate with them in the first place where it was felt that the size of the undertaking or the infrequency of the process warranted their exemption from all or part of the regulations.

GAS-WORKS RECORDERS.*

Reviewed by Walter W. Crosweller, A.M.I.Mech.E.

"GAS-WORKS RECORDERS" is a good book written at a good time. Scientific control by the use of indicating and recording instruments generally, which began about twenty years ago in this country, has now won through, and to-day is of paramount importance in gas-works, as in almost all works having plants and processes to control.

Gas works officials generally have not been slow to make use of recording instruments; and in some of the largest works there will be perhaps little to learn from Dr. Levy's book. Smaller works, however, are naturally in a very different position. With most of the same processes to control, but with only a limited appropriation for instruments, these works must decide which of all these very tempting recorders they will buy. In this they will be helped by a table which the author has prepared giving the scope and application of each recorder. Some who already use such recorders will learn more about them, as there are not many men on a works who master the instruments thoroughly, though this is very often due to the want of a good teacher. Dr. Levy fills that want in the descriptions he gives.

The book is divided into chapters on Pressure and Vacuum Gauges; Pyrometers; Specific Gravity Apparatus; Calorimeters; Gas Analyzers; Volume Recorders; Densimeters and Depth Gauges. The illustrations are excellent, and the descriptions well written and not hard to follow. The evident care taken in this part should lead some manufacturers to do the same in their pamphlets and working instructions. The method the author has adopted of separate description of essential parts, makes the whole very clear, and teaches by comparison.

The general remarks (on charts, pens, clocks, &c.) are very useful. The work involved in the making of even these details is often not recognized, and a few notes thereon will be useful. One may perhaps add a note of prophesy here, and say that all "square root" and "expanding" charts being a nuisance, instruments of the future must have "straight line law" charts—*i.e.*, uniform charts which can be averaged, computed by planimeter, or integrated more easily.

The chapter on recording pressure and vacuum gauges gives no new information until it comes to deal with Widlake's and with Sinclair and Taylor's long-distance pressure recorders. This interesting subject is dealt with in a way which will be found very useful for reference.

Recording pyrometers of the mechanical and electrical types are very well dealt with in turn. This is one of the best chapters.

The chapter on recording calorimeters is, of course, the best part of the book. Every type of recording calorimeter at present in use is described in detail and compared as to type and results. Summarized reports of the Gas Investigation Committee of the Institution of Gas Engineers are quoted. As this is the first book to group these calorimeters thus, and as the subject is such a pressing one just now (in spite of the "Daily Mail" agitation), we anticipate that this will be the most eagerly read—and in these hurried days very often the first chapter read.

Gas analyzers are not so well handled, because the author has omitted to deal with them as fully as he could. An interesting

* "Gas-Works Recorders." By Leonard Levy, M.A., D.Sc., F.I.C., F.C.S. London: Benn Brothers, Ltd. [Price 35s. net.]

reference is made to the very first CO_2 recorder—the Arndt (patented in 1900), which many readers will remember as the original Ados CO_2 recorder, and of which there are still one or two in use in this country. The author says, however, that the Arndt recorder could not be used for the modern practice of balanced draught, referring presumably to boiler plants. The reviewer is prepared to maintain, however, that it could be employed for balanced draught systems quite as well as for those in use when first it appeared.

Dr. Levy also says that the next advance was by Simmance. This is not so. The next advance was by Hartung, the inventor of the CO_2 recorder now known as the "Sarco." Hartung commenced his inventions in 1905, and so gave a start to the design of the compact, water-driven CO_2 recorders available to-day.

The Edwards sulphuretted hydrogen recorder is described; but there is no reference to an H_2S recorder on the market at least fifteen years ago, and made by the firm of Gasmesser Fabrik Elster, of Mainz. Both types give a colour test on lead acetate paper. An H_2S recorder giving percentages of H_2S or grammes of H_2S per c.ft. of gas would, of course, be much more useful.

Volume recorders take up another long chapter, subdivided into gas-meters, steam-meters, and liquid flow meters. The chief interest of this chapter lies in the steady advance of the electrical and other gas-meters which appear likely to replace the station meter. This latter is not described, as it is not, of course, a recorder.

The final chapter on densimeters (two types described) and a liquid depth gauge (one type described) completes the book except for three appendixes.

So much for what is described. What is not described or even referred to includes recorders many of which are as well known and more widely used than those the author treats. Naturally enough in such a work, the author has devoted most of his space to the recorders with which he is familiar. This is perhaps inevitable; but that about 60 out of 202 illustrations should belong to apparatus of one particular firm, looks hardly impartial.

The publishers claim that "almost every known form of recorder is dealt with." The author claims that "the book is intended to give a description of the *modus operandi*, application, and care of all recording instruments of utility in gas engineering." These large claims do not appear to be justified.

In the chapter on recording gauges, there is no mention of the very well known Bristol recorders.

In the chapter on recording pyrometers there is no mention of the excellent instruments by the Bristol Company, Jules Richard, or Henri Fournier.

In the chapter on gas analyzers there is no mention of the well-known "Auto" CO_2 recorder, or the Hays CO_2 recorder, or the "Mono" CO_2 recorder and CO_2 and CO recorder, or the "Arkon" CO_2 recorders, O_2 recorders, and CO_2 and O_2 recorders. There is no description of an oxygen recorder in the whole book, though the use of this instrument is steadily growing.

In the chapter on volume recorders there is no mention of the British Thomson-Houston steam meter (perhaps a subtle aspect of the gas *v.* electricity feud). There is no mention of water-meters made by Glenfield & Kennedy, Frosts, the Worthington Company, and the National Meter Company.

Further, there is not one reference to the Lea V-notch meter. This surely is the most widely-known open type of water meter in this country. It is the parent of the less well-known types which have been described.

We could name many more instruments. Some must be left out, of course; but the instances we have quoted give the impression sion that the author is a little out of touch with actual practice.

Measurement of Specific Gravity of Gases in Small Quantities.

From H.M. Stationery Office we have recently received a pamphlet (which we acknowledge with thanks) by Alfred Blackie, M.A., describing an apparatus designed at the Fuel Research Station for the purpose of measuring the specific gravity of gases in small quantities. The publication constitutes Technical Paper No. 5 of the Fuel Research Board. For the bulky makes from the vertical and horizontal retorts, a Wright's effusion bell has proved satisfactory; but without careful observations and viscosity corrections, it is not serviceable for dealing with the small makes from laboratory-scale low-temperature carbonization. The apparatus is based upon the balancing of a column of gas against a similar column of air; the difference of pressure being measured by a Chattock's tilting gauge. The number of readings required to ensure reliability has been reduced by the introduction of several ingenious features, and by the employment of tubes 24 ft. long and $\frac{1}{2}$ in. diameter. The pamphlet describes the apparatus in detail, and in connection with a diagram; and the working of the Chattock gauge is explained. The accuracy for which the apparatus was designed was 0·5 p.ct. for gases of sp.gr. varying from 0·4 to 0·6; and tests carried out show that this been realized. The price of the booklet is 3d. net, or 4d. post free, from any branch of H.M. Stationery Office.

Through the efforts of the Chamber of Commerce, Ruston (La.) has at last secured natural gas. The franchise stipulates for the work to be commenced within six months, and the mains to be laid throughout Ruston within twelve months.

RATING IN SCOTLAND.

By GEORGE EVETTS, A.M.Inst.C.E.

THE writer would take this opportunity of thanking Mr. Ibbs for his review of the book "The Administration and Finance of Gas Undertakings," which appeared in the "JOURNAL" of Dec. 6, and also Mr. Napier for his letter in the issue of the 13th.

A technical author is usually grateful for having errors of omission or commission brought to his notice; and in the former review Mr. Ibbs draws attention to a slight error when the author gives credit to the Gas Companies' Protection Association for income-tax arrangements which were effected by another representative body. Mr. Napier draws attention to errors of a more serious nature which will be dealt with later. Both contributors, however, make reference to the inadequate treatment of the important subject of rating; and the writer would like to explain that the book had, during the progress of elaboration of several important matters, greatly exceeded the length originally intended, with the result that the publishers were reluctantly compelled to increase the price.

The result is that the rating section was cut down to a half-dozen pages, in which the writer endeavoured to give a brief elucidation of the principles of rating, with figures for a typical case. A further page was given to the special features of Scottish rating; and it is this particular page that fails to meet with Mr. Napier's approbation. The writer naturally regrets that the subject was not further elaborated; and it shows the lack of wisdom in not omitting altogether matters which might be considered misleading or incomplete.

In the book the writer ventures the opinion that rating is a matter for the expert, and Mr. Napier's criticism (which is perfectly fair) endorses this opinion. Taking Scotland for example, the rating expert would make it his business to be in touch with every local or regional agreement which had been made by groups of undertakings and rating authorities; whereas the writer only confined his remarks to the amendments in principle with which he had been brought into contact.

With reference to the detailed comments of Mr. Napier, the matter of tenant's capital was first mentioned, and the writer is questioned for taking the English basis of three months' expenditure, six weeks' coal stock, *plus* the value of meters, stoves, &c. These sums added together form the tenant's capital; and in principle, either in England or in Scotland, it is admitted that tenant's capital is necessary. The actual figure would be the sum adequately necessary to run the business. With regard to the meters, stoves, and moveable plant, it was assumed in both England and Scotland that the figure of £22,000 for the structural value was a reasonable one, and acceptable to the undertaking as well as the rating authority. Regarding the balance of £10,312 (made up of three months' expenditure *plus* six weeks' stock of coal), Mr. Napier is not in agreement; and he further states that in Scotland "in almost every instance" half the working charges is allowed. Now the writer of the book is aware of one specific case where this is not allowed, and in the typical case the allowance on this basis would be £15,825. The writer has little hesitation in stating that this sum is excessive in the majority of cases. The lower figure was adhered to for the Scottish example, because it is considered adequate. If the rating authority were advised by an expert with accounting knowledge, this expert could extract the floating balances from the printed accounts or from information which the gas company would be called upon to furnish, and could prove before any tribunal that the amount represented by the £15,825 in the typical case would be excessive in nine cases out of ten. In these circumstances, therefore, the more reasonable figure of £10,312 was adopted; and it is difficult to imagine the larger sum being allowed. The writer is not doubting that in Scotland the amount of half of the annual expenditure has been agreed to many times; but on reference to a paper given in December, 1920, by Mr. Thomas Orr, of Motherwell, we find a Scottish official quoting his own figures and taking five-twelfths of the annual adjusted expenditure, *plus* six weeks' coal, showing that six months is not universal.

The writer has had the further opportunity of investigating the accounts of some 60 gas undertakings in connection with applications under section 1 of the Gas Regulation Act. In these applications, the necessary interest on floating capital has been almost invariably the subject of detailed examination, and in no case has the necessary floating capital exceeded one-third of the annual revenue expenditure, even including that necessary for coals. The average is near 25 p.ct. In other words, if the capital expenditure were equal to the capital (share and loan) raised, and there were no funds or carry-forward, then a bank loan of not more than 25 to 30 p.ct. of the annual expenditure would be necessary.

In taking three months' working expenses and six weeks' stock of coal, therefore, it was not intended to follow either English or Scottish practice; for in England the usual practice has been four-and-a half months. The writer inserted a figure which would be adequate in nine cases out of ten, and generous in the majority of cases, but at the same time be moderate enough to encourage acceptance by the rating authority.

With reference to the next point, Mr. Napier is correct in assuming that the writer is not aware of the negotiations and subsequent settlements in the report issued by the Local Lands Valuation Assessors of Scotland in connection with the vexed

question of what constitutes tenant's capital. As previously explained, the figure inserted in the typical case was assumed to be a reasonable one, and even with the report referred to, it is to be noted that all gas undertakings do not accept the same as satisfactory. In his book, the writer deliberately refrained from dealing further with the intricacies of tenants' capital. These are of much more importance in England, in view of the 17½ p.ct. multiplier as against 5 p.ct. in Scotland. In some cases the tenant's capital can be increased by legitimate means to such a high figure that the deductions under the head of tenant's capital exceed the profit, and the net rateable value becomes a *minus* quantity. This goes to prove the difficult and insecure position of the hypothetical tenant, if he continues to push forward his claim to 17½ p.ct. on his capital.

With reference to the figures given as deductions from the gross value, Mr. Napier is correct in stating that the Scottish rating law does not allow depreciation as a statutable deduction. The gas suppliers, however, do (or should) get the allowance in some form or other. There are two distinct bases of assessment in Scotland: (*a*) The figure which enters the valuation roll, wherein statutable deductions are not allowed, and (*b*) the figure under the Poor Law (Scotland) Act, 1845, section 37 of which is referred to by Mr. Napier. The rateable value under the Poor Law Act is ascertained after the figure in the valuation roll, and is only applicable to certain rates levied. In this connection it should not be forgotten that section 41 of the Burgh Gas Supply (Scotland) Act, 1876, lays down that the Commissioners are to fix the price of gas to raise a certain income. This income is to provide the working expenses, contribution to the sinking fund, and to "provide for a depreciation and renewal fund sufficient to maintain the works in perpetuity." Therefore, it does not appear unreasonable to claim something over and above the actual cost of repair before arriving at the rateable value.

It should be observed that, in the paper previously referred to, Mr. Orr includes in his figures distinct percentage depreciations on buildings, machinery, mains, meters and cookers, and apparently succeeded in establishing this claim. Rating in Scotland is further complicated by the differences in treatment of profit-earning and non-profit-earning Corporations. Some undertakings are by Statute prohibited from earning more than is required to enable them to pay their way; and in cases of this description it has been held that no distinction should be made between landlords' and tenants' expenditure. The net revenue in such cases is obtained by deducting from the gross revenue the cost of running the undertaking and keeping it in a state of repair necessary to command the revenue, with the minor exceptions of feu duties and the landlord's portion of the taxes. In the case of profit-earning undertakings, the tenant's obligations are admittedly distinct, and the annual value is ascertained by taking the annual revenue and deducting the expenditure, also a percentage on capital invested by the tenant on movable property, and an additional sum for tenant's profits.

There is a class of undertaking which may be stated to be profit-earning or non-profit-earning, according to the point of view—*i.e.*, undertakings with power to provide a reserve fund to meet deficiencies of income or extraordinary claims or renewals, and to charge such a price for gas as would provide the contribution to this fund. It has generally been admitted, however, that such undertakings are non-profit-earning; and in these cases contribution to the reserve fund is admitted as revenue expenditure. This is, of course, getting very near to a depreciation allowance.

With reference to the sums which have been claimed under the heading of repairs and depreciation, it has been laid down that the expense of "renovating buildings, gasholders, and mains" is a proper deduction. It is obvious that this simple description is capable of a very wide difference of opinion in practice.

It is necessary for the whole question to be thoroughly investigated and settled on simpler lines. In some cases (acting on the advice of a rating surveyor) the writer has agreed to assessments being made on 18 to 22 p.ct. of the gross profit, which at one stroke clears away most of the complexities. The tenant's capital is part of the business. It cannot be eliminated from the landlord's capital in the gross capital of the undertaking; it is part of the capital which earns the profits, some profit directly, and much more indirectly.

Nominally, the gas undertaking is assessed on its profits; and when profits increase, no reasonable person should object to paying increased rates. By adopting the method mentioned above, the effect is equal to establishing a claim of 80 p.ct. or thereabouts as a statutable deduction.

The writer is obliged to Mr. Napier for the information which he has given regarding the differences between English and Scottish methods; and the Editor of the "JOURNAL" is thanked for this opportunity of amplifying the scant remarks in the book referred to.

The criticisms, coupled with these further notes, will indicate the complexity of the problem and the differences in actual practice which are likely to arise.

The writer regrets that the Scottish method of rating was not eliminated completely, as it would have been better to have done this rather than insert figures of which no explanation was given, particularly when an uncommon method of treatment is chosen in the illustration of a principle.

In a further edition of the book, it may be possible to deal more fully with the subject of rating in general and Scottish rating in particular.

HEAT INSULATING MATERIALS.

By W. NEWTON BOOTH, of Woolwich Arsenal.

[A Paper read on Dec. 15 before the London and Southern District Junior Gas Association.]

When any heated surface is exposed to the atmosphere, it loses heat at a rate depending on many factors, but chiefly on its extent and the difference between its temperature and that of the air. The diagram below shows how the value of the loss per square foot per degree (Fahr.) difference of temperature varies; but for rough calculations it may be taken that in still air each square foot of surface will lose 3·0 B.Th.U. per hour for each degree difference in temperature between it and the air. If there is a draught, or if the surface is exposed or wet, the loss will, of course, be vastly increased.

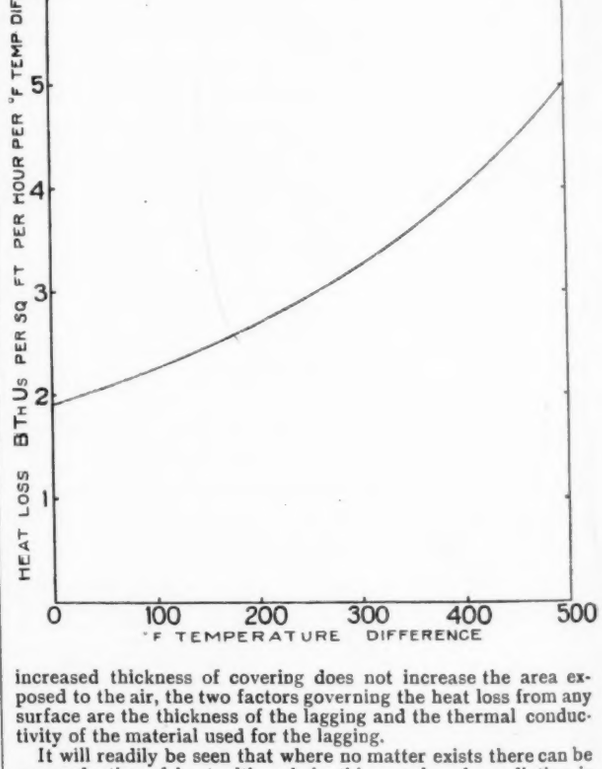
Cases occur in the experience of every technical officer of a gas undertaking, in whichever department he may be employed, where the heat so lost from exposed surfaces forms a very serious item of expenditure. No apology is needed, therefore, for bringing this subject before the Association.

The most usual method of reducing the heat loss from hot surfaces is that of "lagging" them—*i.e.*, of interposing between the hot surface and the air a layer of some material which offers a high resistance to the passage of heat. This layer prevents radiation from the hot surface and suppresses the contact which would otherwise cause loss by convection, and therefore compels all heat leaving the surface to traverse the layer by thermal conduction.

When such a layer has its two faces at a different temperature, the amount of heat which will be conducted through it is given by the formula:

$$\text{Heat loss} = \frac{k \times \text{area of layer} \times \text{difference in temperature of faces}}{\text{thickness of layer}}$$

where k is a property of the material called its coefficient of thermal conductivity. It will be seen that in those cases where



increased thickness of covering does not increase the area exposed to the air, the two factors governing the heat loss from any surface are the thickness of the lagging and the thermal conductivity of the material used for the lagging.

It will readily be seen that where no matter exists there can be no conduction of heat, although in this case loss by radiation is not prevented. This is the basis of the well-known "Thermos" flask, in which a container is surrounded by a vacuum jacket. Any of you who have had experience of this contrivance can testify as to its success in preventing loss of heat. At the present time, however, it has not proved commercially possible to apply this method to many of the problems which arise; and one is driven to find a more material solution.

On examining any table of values of the "k" of different substances, one cannot help being struck with the very low values found for the permanent gases. As a matter of fact, the loss by conduction through air is very small indeed; but the mobility of the fluid allows of the setting up of violent convection currents which carry away heat rapidly. Some method of preventing such convection currents is, therefore, required if we are to develop the insulating properties of air. This can be found in the dividing-up of the air-jacket into a number of small cells, and the effec-

tiveness of the arrangement will be better the finer the cells, and by the construction of those cells with the least possible amount of solid material.

This is the basis of nearly all lagging materials in common use which owe their efficiency to being very highly porous—*e.g.*, cork, wood sawdust, porous bricks, wool, felt, asbestos, diatomite, &c.

One of the latest and most successful materials is known as plastic magnesia, and consists of 15 p.ct. of asbestos fibre as a binder, mixed with a very light form of magnesium carbonate containing a small amount of some adhesive material in order to make it stick together. This material has a conductivity less than 3 times that of air itself, and is a most effective insulator.

A layer 1½ in. in thickness will reduce the loss of heat from a steam-pipe to less than 10 p.ct. of what would be lost from a bare pipe. Bearing in mind that such a pipe would lose approximately 700 B.Th.U. a sq. ft. per hour, and that if it was working only 2000 hours per annum this would amount to a loss of 14 therms, probably as steam about 3d. per therm or 3s. 6d. per annum, it will be seen that it is a good business proposition to pay (say) 1s. 3d. per sq. ft. for a good lagging. For men on distribution work where heat supplied as gas costs (say) 9d. per therm, the higher price will show the importance of proper lagging of such gas-consuming appliances as cookers, wash-coppers, and water-heating installations in general, if consumers' interests are to be studied and we are to meet the competition of other forms of heat supply. The lagging of furnaces also is an important question, and will well repay careful study.

The appended table gives the physical properties of a number of the commoner lagging materials; and it will be seen how much they may vary in quality. A rough test of the efficiency of a lagging in position is to take the temperature of its outer surface either with a thermometer or merely by means of the hand. The ratio of the difference between the temperature of the hot surface of the metal and that of the outer surface of the lagging to the difference between the temperature of the hot surface and that of the air, gives a rough guide to the efficiency of the lagging, which should approach to 90 p.ct. to be satisfactory.

Owing to the porous nature of most lagging materials, they have little mechanical strength, and need reinforcement and protection if they are to have a satisfactory life. The former can be provided by embedding ordinary galvanized wire netting between the lagging material and the thin layer of hard cement with which it is usual to cover it, and the cement by a covering of hessian canvas, supplemented by a metal or other guard where there is risk of mechanical damage. It is also very necessary to prevent access of water, which not only destroys the strength of the lagging, but by filling-up its pores with a fairly good conductor, absolutely defeats the object of the covering. In ordinary circumstances, it is sufficient to coat the hard cement layer with a waterproof paint; but the author has also used successfully a layer of waterproof paper under the canvas.

The author has purposely not burdened the paper with the mathematical formula for calculating the design of lagging systems, as time does not permit; but he hopes that enough has been said to stimulate interest in the importance of the proper choice and use of heat insulating materials, and that this will provoke a good discussion.

Table of Physical Properties of Common Insulating Materials.

Material.	Thermal Conductivity C.G.S.	Density. Lbs. per C.Ft.
Air	0·000055	0 0081
85 p.ct. plastic magnesia	0·00017	11·0
Slag wool	0·0002	15·0
Vitribestos	0·00033	36 0
Moulded asbestos	0·00024	..
Asbestos fire felt	0·00034	..
Diatomite	0·00025	21·8
Very poor lagging	0·0006	50·0
Porous bricks	0·0004	28·0
Firebrick	0·002	120·0

DISCUSSION.

Mr. BOOTH, after he had read his paper, drew attention to a number of samples of materials used for lagging which he had with him.

The PRESIDENT (Mr. D. Cleave Cross) said the paper was one which drew their attention to small details that mattered on the works. It was a subject in which it was difficult to get some people to take much interest; but the amount of money that could be saved on a works by efficient lagging was enormous. When one came to work-out the loss that might arise, it was simply amazing. The top and the pipes of a boiler were often lagged, while the front was left. The table at the end of the paper was very valuable, and would be well worth keeping handy. Was the plastic magnesia in the form of a brick?

Mr. BOOTH: You can get it moulded, but it is usually a powder.

The PRESIDENT said it had a remarkable efficiency. The "Nonpareil" brick was very light, and good for lagging, especially in water-gas sets and for waste heat boilers. It had a very high coefficient—0·0004, which was five times better than firebrick. He would like to emphasize the importance of keeping water out. Sometimes people spent pounds and pounds in putting lagging on exposed steam-pipes, and then did not worry; but if it was not maintained properly, the water soaking into it destroyed its efficiency from the thermal conductivity point of view, and great loss resulted. Lagging should be always in a condition to keep out water.

Mr. H. W. KERRIDGE (Croydon) remarked that the lagging of pipes was just as important on the district as on the works. The heat losses from horizontal pipes particularly were enormous. If more attention were paid to the insulation of pipes in their domestic water heating work, fewer complaints would be heard. He had been very interested in the plastic magnesia, but the price of 1s. 3d. per sq. ft. compared unfavourably with that of other materials.

Mr. F. J. PEARCE (North Middlesex Gas Company) asked how plastic magnesia compared with asbestos. He had been given to understand that the life of the plastic magnesia was very much shorter than that of ordinary asbestos pipe covering. It came out a little cheaper; but when the life was taken into account, he believed the asbestos covering came first. As to protecting pipes and keeping-down heat losses, the author put the possible loss on a pipe working 2000 hours a year at 3s. 6d. per sq.ft. per annum; and when they came to consider the miles of steam-pipe that existed on an ordinary gas-works, one could realize by this what the losses were going to be if they were not properly covered.

Mr. W. GROGONO (Gas Light and Coke Company) said he did not think this was a small detail at all. On the contrary, it was a very big one—especially when one was dealing with a retort-house of thirty or forty beds, and attempting to lag that. The brick Mr. Booth referred to had been used very extensively for lagging. It was one that wanted very careful watching.

Mr. E. W. L. NICOL (London Coke Committee) said that in the course of business he had to visit many works, including gas-works; and although he had seen the steam-pipes very carefully covered, for some reason the flanges were left bare—he had never been able to ascertain just why. Probably it was so that it could be seen when they leaked; but the fact of their being uncovered was the first cause of leakage at the flanges. The heat loss from an uncovered flange was substantial; and what it was from an uncovered boiler front they might imagine. There seemed to be an erroneous idea that asbestos was a good insulator. Its value compared with other things, he thought, was very low. But if he recollected rightly, the Federation of British Industries had gone into the matter carefully; and they might have dealt with material that Mr. Booth had omitted to deal with. The results of their tests were available to anyone affiliated through membership of the National Gas Council.

Mr. W. L. WESTBROOK (North Middlesex Gas Company) said he would like an opinion as to the relative value of insulating a gas-cooker with air or slag wool. He fancied that slag wool, especially where the lagging was not closely fitted, in time became more or less saturated, where exposed, with greasy vapours.

Mr. F. A. FROST (South Metropolitan Gas Company) remarked that a lot had been said as to the difference between magnesia and asbestos. He thought the greatest difference was one of cost. In connection with a very large installation of gas heating, elaborately lagged, they found the best results, both financially and in efficiency, to be obtained by a primary application of asbestos, and then galvanized wire netting to hold it together, and also to act as a key for the magnesia. Lagging was very often sold by weight; and though there were some materials on the market the price of which per hundredweight was low, to bring the job up to the same efficiency as with higher-priced material one would have to spend as much on the lower-grade stuff, as a bigger coating of it was needed. He believed there were limits to the quantity of lagging that should be put on different diameter steam-pipes, to give maximum efficiency in relation to the outlay.

Mr. BOOTH, in reply, said there was one point he would like to make in connection with the study of all these little details, and this was the great necessity of keeping before one's mind the ultimate object of the work. It was so very easy to get things out of perspective. The effect of water getting into the lagging was very bad. First of all, if the water penetrated to the pipe, it had to be evaporated; and this took much more heat than the bare pipe would take. He was trying the lagging of the front of boilers, and would be able to tell them more about this when he had before him the results of actual experiments. Reference had been made to the importance of lagging water-heating installations. He had come across an instance of the importance of this. The method of applying plastic magnesia depended a great deal upon circumstances. It could be bought as a powder, and then mixed with sufficient asbestos fibre to give a bond to it, and put on the pipe in layers until it totalled 1½ in. in thickness. He had been asked about the life of asbestos covering, as compared with plastic magnesia. There was no doubt that the ordinary asbestos covering was stronger mechanically than magnesia. It was not anything like so good a lagging material; and if care was taken, he did not see why plastic magnesia should not have a very satisfactory life. He reckoned on three years at least as being the useful life of the new lagging. Mr. Grogono referred to lagging an ordinary retort-setting. If they reckoned out what heat they were losing, he thought they would go in for this lagging. The losses from flanges were a very important matter. Mr. Nicol referred to the value of asbestos. It depended to a great extent upon what sort of asbestos one was speaking about. The important thing was how it held air. So far, 85 p.ct. magnesia was the best material he had come across. An air-jacket for gas-cookers was not in itself much good as a lagging. The remedy for getting grease into slag wool was to make the joints properly. He did not like air jackets when effective lagging was important. It had been pointed out by Mr. Frost that laggings were sometimes sold by weight. It was no use buying rubbish. For very small pipes it was more necessary that the lagging should be good than for bigger pipes; but 1 in. or 1½ in. was sufficient, if one had a reasonable quality.

Method of Collecting Mine Samples.—Collecting mine samples of coal by the American Bureau of Mines involves selecting a representative face of the bed to be sampled; cleaning the face; making a cut across it from roof to floor, and rejecting or including impurities in this cut according to a definite plan, as they are included or excluded in mining operations; reducing this gross sample, by crushing and quartering, to about 3 lbs.; and immediately sealing the 3 lb. sample in an air-tight container for shipment to the laboratory.

XUM

COMPLETE GASIFICATION AND THE TULLY PLANT.

The Discussion.

On pp. 736-38 of last week's "JOURNAL" we published the text of a paper on the above subject, read by Mr. N. Sampson Smith, B.Sc. (Gas Eng.), before the Yorkshire Junior Gas Association, on December 16, at the Gas Department Offices, Halifax. The meeting was well attended, and an interesting discussion ensued.

The PRESIDENT (Mr. H. L. Bateman, of Wakefield), in opening the discussion, said they had heard a highly interesting address on a subject of the utmost importance, and one possibly with great developments ahead. It was a paper which should bring forward a good discussion.

Mr. C. D. CAWTHRA (Halifax) said he wished to congratulate Mr. Smith on the exceptional interest which he had put into what was admittedly a somewhat hackneyed subject. Gas associations had had a good many papers on the Tully plant and on complete gasification; but Mr. Smith had aroused great interest in a subject on which views were by no means all in agreement. The historical facts as to the plant, which he had given, were very valuable; and he had stated them briefly and concisely, instead of demanding that his hearers should sit through a long discourse merely recounting facts which many people probably knew already. A little history was often necessary, because one could hardly deal with the present unless one reviewed, to some extent, what had been done in the past. Mr. Smith had given many figures. Probably they had not made a very great impression on the minds of those present, because they could not carry masses of figures in memory; but they would be there to be studied more closely when the paper appeared in print. The tests Mr. Smith had given showed what very different results were to be obtained from practically the same plant in different places. The highest calorific value in B.Th.U. per cubic foot was 333 in test "D." At his (Mr. Cawthra's) place they had been working a plant for some time under most of the conditions which were set out in Mr. Smith's table, and also under other conditions. They got a very much higher average calorific value than 333. As a matter of fact, he believed for last month their therms per ton from the Tully plant were about 209. The question as to when it paid to work on complete gasification lines as compared with the ordinary systems of carbonization was purely one of markets, and in Halifax they had found lately that there was not a very great deal between the two processes. One of the costs which was rather an "eye-opener" was that of steam; and Mr. Smith mentioned this only in pounds sterling. The cost of steam-raising and its labour was an item which demanded very careful consideration in the working of a Tully plant. There were, of course, a good many points in the working of a plant, but they were all capable of solution; and in Halifax, he must say, they had had very good results with the plant they had installed, and had every reason to be satisfied.

A MEMBER (to Mr. Smith): How often was the fire cleaned?

Mr. SMITH: Every eight hours.

Mr. C. R. INGHAM (Wakefield) said he would like to compliment Mr. Smith on his paper, particularly because it was to be noted that his figures had been obtained under somewhat difficult conditions. With regard to the calorific value of the gas, working on coal alone, and the figures of Mr. Cawthra as to gas produced, he would like to know the volatile content of the coals used, because this would exercise some influence on the calorific value of the gas.

Mr. W. B. M'LUSKY said he had not wished to speak on this occasion, because he felt that at junior association meetings the juniors were the people to do the talking. If there was one thing outstanding in junior associations, it was the fact that the young men of the industry were in no sense politicians. They were engineers, and said just what they thought. He wished to say a few words, however, because he was engaged in working complete gasification at Halifax, and because he highly appreciated the address given by Mr. Smith. It was a remarkable paper, and reflected the greatest credit on both the technical knowledge and the general education of the author, because he expressed himself in good sound English language. But he wanted to quarrel with Mr. Smith on his definition of "utility." Mr. Smith said his tests were utility tests, and not mere figure tests. One must be very particular with words. "Utility," to his (Mr. M'Lusky's) mind, was economy with efficiency, and should be used in that sense, and in no other. Sometimes they, as engineers, got a little mixed up in the use of their words, and those who were listening did not always perceive entirely what was meant. He took it that Mr. Smith did not mean that he was regardless of economy in his tests, though he was particularly after utility; and it was to be appreciated that he had come there that day with actual day-to-day working results. Some time ago, there was reference in the Technical Press to the question of curtailing the output of coke. It was said that the industry should make any amount of coke and send round canvassers in the district and sell it. They should buy coal, and make coke and sell it. They all, of course, hoped to sell their coke, if they had any in stock. Hope was largely a thing of the future. Doubtless they had all been trying to sell it for a long time. He had been trying at Halifax for ten years, and they certainly were selling coke. But in every business it was found that, if one had huge stocks of unsaleable material, one could not sell. When they had a big stock of coke, even people who were willing users of it, and appreciated its heating value, complained about its price. At Halifax just now they were selling at 27s. 6d. per ton at the works, which he thought was reasonable. A question that arose was, Is it good business to buy coke from their own works' stock, and use it for a good purpose? He thought it was a right thing and a good thing to do, if it could be bought at a proper price and employed usefully. Was it better to buy coal and make gas with it in a complete gasification plant or have a little more coke for selling? He thought it depended largely on local conditions. With a complete gasification plant one could choose whether to use coal or coke, or part one and part the other. In any case there would be no surplus coke to hawk. If the coal-gas plant was used under the best conditions, one might hope to get 90 therms per ton. They had not got 90 therms yet; but, as he had said, hope was a thing of the future. At Halifax they had got 83 therms per ton. They had the best retorts they knew of, but did not claim 90 therms. His own figure was 208 8 therms per ton from the Tully plant. They had a little advantage in having four generators working in turn. They had been obliged to adopt this system because of the small storage space they possessed. He did believe a complete gasification plant was a very valuable auxiliary, especially if there was difficulty in selling the whole of the coke from the ordinary process. Since they started in Halifax making rich gas in retorts and getting it down with carburetted hydrogen gas from the Tully plant, they had known nothing of naphthalene. Like most other people, they had had their experiences of useful economies in the retort-house being lost in distribution, because of the naphthalene made. It was not uncommon in a town of the size of Halifax, under those old conditions, to have to keep twenty or thirty men ready to deal with naphthalene whenever it might be troublesome. This, of course, was a distinct argument in favour of complete gasification plant. Since they started making gas on this system at Halifax, in conjunction with their ordinary plant, they had reduced distribution costs by the fact that they did not have to keep any men in reserve. Even though, in some cases, complete gasification might cost more per 1000 c.ft. to manufacture, a mixed gas of undiminished value could be delivered at a lower cost because of the reduced distribution charges.

Mr. SMITH, replying, said that the amount of fuel required to raise steam and drive the fan was 700 lbs. per ton of coal gasified. The cost of the fuel for this purpose was 10s. per ton; and this accounted for the low figure given for this item. In answer to the question of Mr. Ingham, the volatile matter in the coal used for the tests was 35 p.ct. Referring to Mr. Cawthra's therms per ton, Mr. Smith thought that 209 therms per ton was a very high yield. Let it be assumed that in the water gas 60,000 c.ft. of gas of a calorific value of 300 B.Th.U per c ft. were made per ton of coke gasified, which might be considered efficient working. Let them assume also that 12,000 c.ft. of gas of a calorific value of 510 B.Th.U. per c.ft. were evolved in the carbonization of 1 ton of coal. Then 1 ton of the coal used in the tests, allowing for no loss, would produce 12,000 c.ft. at 510 B.Th.U. per c.ft. and 40,000 c.ft. of water gas at 300 B.Th.U. per c.ft., taking into consideration that the volatile content was 35 p.ct. This was equal to 181 therms per ton of coal gasified, which was slightly in excess of the figure actually found. With regard to distribution costs, if the gas was of lower calorific value, more had to be distributed to carry the same heat value; and although he agreed that naphthalene troubles would be greatly lessened, surely the expense of distributing gas of lower calorific value resulting from the addition of Tully or water gas must be much greater than the corresponding cost for coal gas—from volume considerations. In using the Tully plant as an auxiliary, care had to be taken in mixing the coal gas and Tully gas, which was not a simple matter. Unless care was taken, stratification would occur, with the corresponding annoyance to consumers.

Mr. R. N. WEBB (Meadow Lane Works, Leeds), proposing a vote of thanks to Mr. Smith, said he had not personally had the privilege of working any complete gasification plant, but his impression, from what he could gather, was that total gasification was the system of the future. He had had a fairly long experience with both horizontal retorts and inclines; and in the very near future he would have the pleasure of having three systems of vertical retorts at Meadow Lane, so that the works would be a kind of test works of the various types of plant. One of the first objects of the gas industry should be to put up a plant which was lower in initial cost. Present-day verticals were pretty expensive. His own impression was that these total gasification plants, after perhaps a few more years' perfecting, would be easily the cheapest plant to instal and work, and that with more science brought to bear on them they would rank as the cheapest producers of gas. The mixture, in the opinion of Mr. Webb, should be a gas which was clean to use, with both heat and flame temperature; and he believed total gasification reached this end in the simplest and quickest manner of any method known. At Meadow Lane their plant was being gradually improved and the results were extremely satisfactory; but he did not think the industry could remain much longer thinking about 14,000 or 18,000 c.ft. per ton. They would have in the near future to think more about 40,000 or 50,000 c.ft. per ton. This was essential in the national interests and therefore in the industry's interest. It was up to the gas men to conserve all the natural power the country possessed; and he believed that in this system of complete gasification lay one of the most important methods of so doing. He had a friend who had "taken the bull by the horns" eighteen months or two years ago, putting aside the whole of his plant of horizontals, and running his town on Tully gas only; and he declared that it had given every satisfaction. In his works—a fairly small works, admittedly—it was costing £8 per day less to run, everything included. It was up to the industry to produce gas at a price which would enable people to use it plentifully; and the capital cost of the plant had much to do with the selling price of the gas. These plants were small in themselves, but were capable of producing an enormous amount of gas, and should have every encouragement. There had been, perhaps, rather too much assumption, and what was wanted was a direct statement of working results—not cloaked on the one hand, or in any way boosted on the other. Outspoken papers like that were very valuable, and on right lines. Mr. Smith had given ordinary actual working results, and not special test results. One thing practical men had to think about was the cost of mixing. Mr. Smith had given the wages as the same in each case; but what would it cost on a big scale to mix coal and coke? They would have to empty wagons and employ labour to get the mixture into the plant. This meant, on a big scale, some considerable cost for mixing; and he did not think that cost was really included in the paper.

Mr. SMITH: That is so. Being only a small plant, one man is sufficient to work the plant and elevate the fuel. For a large plant there would be extra cost.

Mr. WEBB (continuing) said this, of course, would add to the price per therm of anything that was mixed. As to the cost of steam raising for the Tully plant, in comparing results with those for vertical retorts

for coal gas, it had to be remembered that the latest verticals were all fitted with waste-heat boilers, which produced steam for the rest of the works. The quality of the gas made by this system, he believed, was a step in the right direction. They did away with the old rich yellow flame, which covered the bottom of the vessel. The short flame was the more economical; and there was no doubt that people who had used 500 and 550 B.Th.U. gas could get just as good heating with the shorter flame.

Mr. CAWTHRA, seconding the vote, said that he would just like to make reference to one point, and that was with regard to mixing the gas. This was a very important point. In Halifax they mixed the coal gas with the Tully gas in the foul main immediately after it left the retorts and the generators, and when it was hot. Thus it got well mixed; and the make of the two gases was continuous, so that there were no violent fluctuations in the calorific value.

Mr. F. LODGE (Wakefield) proposed a vote of thanks to Mr. M'Lusky and the Halifax Gas Committee for their hospitality in providing accommodation for the meeting and light refreshments.

Mr. T. DYSON (Longwood) seconded the proposition, which was carried and acknowledged by Mr. M'LUSKY.

ILLUMINATING ENGINEERING SOCIETY.

A Meeting of the Illuminating Engineering Society was held at the Royal Society of Arts, on Tuesday, Dec. 12—Mr. A. P. TROTTER in the chair—when, as an introduction to a discussion, Mr. Haydn T. Harrison read a paper on "Street Lighting Requirements." The discussion was opened by Mr. Leon Gaster, who contributed some observations on "Street Lighting and Safety." A series of interesting lantern slides was shown.

STREET LIGHTING REQUIREMENTS.

Mr. HAYDN T. HARRISON referred to the Joint Street Lighting Committee, who carried out investigations during the years 1911 and 1912, and said they did much useful work, the result of which was embodied in a paper read by Mr. A. P. Trotter before the Society in April, 1913, under the title "Standard Clauses for Inclusion in a Specification of Street Lighting." Those who have carefully studied this paper will have noted that the Joint Committee represented nearly everybody concerned. Street lighting conditions were studied both from the physiological and photometric points of view, and eventually the majority agreed upon a method of classifying, and the means to be adopted for testing, street lighting. The former was based on the minimum horizontal illumination as measured 1 metre (3 ft. 3⅜ in.) above the ground.

In his opinion, the scientific soundness of this method of classification does not leave much room for discussion, if the meaning of horizontal illumination, and all the factors which effect it, are clearly understood, which is very often not the case. Street illumination is nearly universally provided by light sources erected at intervals many times their height, with the result that the rays which penetrate to the point of minimum illumination—that is, the furthest distance from the light sources—closely approach the horizontal, and are therefore at a very acute angle to the horizontal plane. It is well to remember that the horizontal illumination decreases at a rate equal to the cube of the distance from the light sources, in accordance with the well known inverse-square and cosine laws. Few appreciate the fact that if minimum horizontal illumination is taken as the criterion of street lighting, the illumination would, at the distance and height street lamps are usually placed, be more than doubled by doubling the height of the lamps, and increased nearly eight times by halving their distance apart. For example, lamps 60 yards apart and 12 ft. high give only one-twentieth the minimum horizontal illumination resulting from the same lamps 30 yards apart and 24 ft. high. Thus, without providing any more luminous energy, the illumination of a street, according to the standard laid down by the Joint Committee, can be increased ten times by re-arrangement of the spacing of the lighting units.

Another important factor is light distribution. Nearly every source distributes its energy fairly evenly over a spherical area. For many years a large part of the upper hemispherical energy has been diverted into the lower hemisphere; but for obvious reasons it has generally found its way into the section approaching the vertical, and not the horizontal, where it is required for distant illumination. The Holophane Company, by means of their prismatic globes, have succeeded in increasing the luminous energy in this desired direction from two to two-and-a-half times the average. But even this is a small increase, when it is borne in mind that by this circular distribution much of the luminous energy is used in brilliantly illuminating either the frontage adjacent to the light sources or the surrounding country, which form no part of the road or street to be shown-up. To realize this, take the previous example of lamps 60 yards apart, each of which illuminates a circle 180 ft. in diameter, having an area of 24,600 sq. ft. Out of this it is only required to illuminate a strip of road 40 ft. wide, representing 7200 sq. ft., which means that less than a third of the illuminated area is utilized.

In order to prevent this serious loss of luminous energy, Mr. Harrison devised what is known as the longitudinal system of street lighting. By this device the luminous energy radiating from the lower hemisphere of the source is not interfered with, but that of the upper hemisphere is collected in a special reflector which concentrates it into an angle of about 20° or 30°. These rays are divided by two lower reflectors mounted radial to the original light source into two directions—namely, up and down the road—in such a manner as to supplement the lower hemispherical rays beyond the point where their power is not sufficient to produce the desired illumination; the power of these supplementary reflected rays increasing as the distance increases. The fact that he is responsible for this device must not be taken as indicating that he advocates the use of very powerful light sources in the street, but that he realizes that if lamps are to be placed at the distance and height now prevailing, such powerful light sources are necessary in order to obtain the minimum illumination desirable for present-day conditions.

Comparing a table of grading published by Mr. O. F. Lacombe in America with that of the English Joint Committee, Mr. Harrison said they were closely alike, and expressed surprise that such a method of grading and specifying street lighting requirements had not been adopted.

STREET LIGHTING AND SAFETY.

Mr. LEON GASTER, referring to the increase in the number of street accidents during the war, said it was generally agreed that the diminution in street lighting was one of the main causes of the rapid increase in mishaps, though doubtless there were other contributory factors. In this country, there must still be much leeway to be made up. Doubtless financial stringency is mainly responsible for neglect to make good the deterioration of the war years; but in many cases the substitution of more efficient and up-to-date appliances would lead to savings which would soon cover the costs of installation. The present time, when a great number of firms are in need of work, and widespread unemployment is giving serious concern, appears an opportune one for putting in hand such street lighting improvements, which would in any case become inevitable in the near future. Among the chief characteristics of street lighting desirable from a safety standpoint may be mentioned: (1) Avoidance of glare in the eyes of drivers or pedestrians from unduly bright sources of light; (2) promotion of reasonably uniform illumination, and avoidance of sharp contrasts in brightness at different parts of a street; (3) suitable "grading" of the intensity of illumination in passing from a side street to a main street (or *vice-versa*), or from one local district to another, so that inconvenient sudden changes in illumination are absent. Further, the part played by certain forms of private lighting cannot be overlooked. The glare from street-lamps is objectionable; but the use of powerful unscreened lamps, either in show-windows or outside buildings, is also prejudicial to the safety of traffic. Whatever encouragement local authorities can give to judicious methods of private external lighting, of a soft and pleasing nature, will also contribute to the safety of traffic in the streets.

In conclusion, Mr. Gaster recalled one other lesson of the war period—the need for some form of central supervision of the lighting of London as a whole. Whatever views may be held as to the utility, as a basis of contracts, of the method of testing proposed in the Draft Standard Specification on Street Lighting, the classification of streets according to illumination requirements is admittedly a valuable feature. A useful preliminary step towards greater uniformity would be the inspection and classification of all the main thoroughfares according to their lighting requirements. Attention could then be devoted mainly to those streets in which the conditions of illumination were obviously inadequate in view of the nature of the traffic. The experience thus gained would doubtless serve as a guide to other leading cities throughout the country.

DISCUSSION.

Dr. CLAYTON H. SHARP, of the United States, after complimenting the Society on their valuable work, gave details of methods adopted in America. In order to arrive at the conclusions set forth in the report of the American Committee on the subject, a large number of tests had been made in New York, extending over many weeks. A considerable section of a quiet street was selected and fitted up with a variety of lighting installations for the purpose of experimental work. Many different types of lighting units were put up, and various combinations were tried with a view to obtaining some really quantitative results. First a row of lamps was erected down the centre of the road; then lamps were spaced alternately on both sides of the road; and, finally, on one side only. Visibility tests were made in the following manner. Small blocks of wood of the same colour as the pavement were placed about, and impartial observers were asked to walk down the street, counting as many as they could see under varying conditions of illumination. Similar tests were made with pieces of sheet iron distributed about, and the results were all tabulated. Observations were also made, by persons in automobiles travelling at various speeds, with a special apparatus by means of which the exact location of each obstruction observed could be registered. One thing which very soon impressed itself upon those who were conducting these experiments was that the elements which enter into the production of good street lighting are extremely complex, and that to adopt a minimum illumination as a criterion of street lighting or as a basis of specifications was not altogether a practicable thing. Mr. Harrison emphasized this when he pointed out that by raising the lamps the minimum illumination could be increased. While this was true, the question was whether the lighting of the street was improved thereby. This, in his judgment, required further demonstration. It was due to this that the Street Lighting Committee of the National Electric Light Association of America had not laid down any too rigid figures. In America, they recognized the difficulty of determining the exact degree of illumination. It was difficult to measure 0·001 of a foot-candle even in the laboratory, let alone in the street. They were not paying so much attention to the

difficult task of standardizing the street lighting; but they were urging the supply companies to push forward in the matter of better lighting fittings and service. He was interested in Mr. Harrison's longitudinal system, which was the most logical system to employ. He himself had devised a similar method some years ago, which was now in use in the United States. In conclusion, he would put forward the suggestion that light which was thrown upward was not by any means lost.

Mr. FRANK BAILEY referred to the compulsory war-time darkness of street lighting, and expressed the opinion that in many parts of the country there had been little improvement since then. He looked forward to the time when all street lighting would be as good as it was in Cheapside.

Mr. W. J. LIBERTY, referring to Mr. Harrison's standard example of lamps 60 yards apart and 12 ft. high, which gave only one-twentieth the minimum horizontal illumination resulting from the same lamps 30 yards apart and 24 ft. high, said that in the City of London they had obtained these very conditions; the height of their lamps being from 25 to 27 ft., and the distance apart about 30 yards. He claimed that they had succeeded in getting main roads that were absolutely shadowless. They had some cause to be proud of the City's street lighting, as they had received visits from many deputations from different countries, who had expressed their admiration of the system. One of these gentlemen who came from abroad to inspect the City's lighting said to him, "If I can drop a pin, and see to pick it up, I am satisfied that the street lighting is good." This gentleman found he could not only do this, but he could also read a newspaper comfortably as he walked from street to street. The present system of lighting in the City had been in vogue for ten years, and during that time they had had many alternative systems suggested; but they had come to the conclusion that they could not improve on the present one.

Mr. S. B. LANGLANDS (Inspector of Lighting to the Glasgow Corporation) was glad the question of definite street lighting standards had come to the surface again. In order to explain his views, he would give a few details of the present practice as regards street lighting in the city of Glasgow. In the main tramway routes and first-class thoroughfares the lighting was by means of flame arcs, having an alleged candle power of 2000, placed at a height of from 20 to 25 ft. and spaced 40 to 50 yards apart. In pre-war times the lesser tram routes were lit with double incandescent gas-burners having a total consumption of 5·6 c.ft. of gas per hour; the gas at that time being a high-grade gas of 600 B.Th.U. The light-yield, which was maintained at about 20 c.p. per c.ft., was 112 c.p. These lamps were placed 22 yards apart, measured on the centre line of the street, and the height of the standards was 10 ft. The quieter thoroughfares were lit with single burners having a consumption of 2·8 c.ft., equivalent to half the lighting previously mentioned. In 1914, they had 1700 electric and 26,000 gas lamps; whereas to-day the figures were 1946 electric and 25,360 gas lamps. The total expenditure in public street lighting in 1914 was £75,604; while the estimated expenditure for 1921-22 was £159,359. The latter figure was for a greatly reduced yield of illuminating power. The double gas-burners were almost entirely done away with on account of the excessive cost of lighting. Including the amount spent for lighting the common stairs, the total cost of public lighting for the city of Glasgow at this date was £313,089. The lighting of the city, covering close on 500 miles of streets, was all under one authority. Moreover, there was no need to lay down a specification to which contractors must work, as the lighting authority controlled the placing of lights, their candle power and kind, and also their maintenance in good order. Gas and electric current were bought in bulk from the Corporation departments which produced them. He would be interested to know the terms of the specifications, if any, between local authorities and gas or electricity supply concerns in London. With regard to gas lighting in Glasgow, they were carefully experimenting with many of the newer types of burners, with pressure governors as against volumetric governors, and so on; and, as wages and the cost of gas and fittings came down, the illumination of the streets of Glasgow would be increased. Some figures they had obtained with the type of directive lantern advocated by Mr. Harrison would be of interest. In one street, about 40 ft. broad, in a part lit by one 300 watt gas-filled lamp in a directive fitting, 27 ft. 6 in. above the ground over centre line of street, the illumination on a horizontal plane one metre above the ground was:

Under lamp on centre line . .	0·95 ft.-candle
10 yards along street	0·41 ,,
20 ,, ,, ,, ...	0·44 ,,
40 ,, ,, ,, ...	0·067 ,,

At the building front the readings were:

Opposite lamp	0·44 ft.-candle
10 yards along street	0·34 ,,
20 ,, ,, ,, ...	0·082 ,,
40 ,, ,, ,, ...	0·038 ,,

In another stretch of the same street the illumination derived from two similar fittings, 50 yds. apart, was: On centre line 0·50 to 0·60 ft.-candle under lamp; 0·52 midway to next; at building front, 0·45 opposite lamp; and 0·107 midway along street. With a directive type of lantern of their own construction, with lamp and height similar to the last, in a lane about 30 ft. broad, the results were;

Under lamp	1·14 ft.-candle
10 yards along lane . .	0·40—0·46 ,,
20 yards ,, ,, . . .	0·17—0·18 ,,
40 yards ,, ,, . . .	0·021 ,,

Illuminations at side of lane varied from 0·82 ft.-candle opposite the lamp to 0·03 ft.-candle along the lane. Maintenance costs would largely determine the class of light used in the future. He was glad to know that the Gas Investigation Committee of the Institution of Gas Engineers were inquiring into the behaviour of gas-burners.

Mr. J. G. CLARK (Gas Light and Coke Company) said that if really efficient street lighting was to be achieved there would have to be a little less talk about economy. The question of street lighting was of great importance, and it might be a good plan for the Society to place on its rules that the subject should be brought up for discussion at least once in every two years. Mr. Gaster's figures were very interesting; but he thought some of them were attributable to the fact that in the latter part of the day people were in a state of natural fatigue, which made them less alert. He thought due allowance must be made for this factor; and even then the figures were not complete enough. Referring to the subject of glare, Mr. Clark said that when it was a case of varying glare, in contradistinction to a steady glare, the disturbing element was a very much greater one; and this was a point that would have to be more carefully gone into in connection with the study of glare. Mr. Harrison was apparently in favour of classification of streets on a minimum illumination basis; but there was a good deal of uncertainty as to the advisability of this.

Mr. R. DAVISON said the principal point that appealed to him in the whole problem was the difficulty of getting good money for good street lighting. The Society would be doing a good and much-needed work if they could bring some pressure to bear on public lighting committees, who required a deal of education on the subject of good lighting. Could they not take steps to send round reports to these authorities, giving them all the latest information on recent improvements?

Mr. H. L. THOMSON (Chairman of the Lighting Committee of the City of Westminster), after relating the difficulties which he had experienced in getting people to realize the necessity of improving street lighting, called attention to an aspect of the matter which was generally neglected—namely, the decorative effect of lighting in relation to public buildings. Millions of money were spent on most beautiful buildings, and no consideration was given to the artistic effect of throwing light upon them. There should be co-operation in this direction between architects and lighting engineers. A point for the consideration of all who were interested in street lighting problems was that the reflected light from large public buildings assisted in the production of a uniform illumination. Another special point to be studied was that they could not go on indefinitely multiplying the number of lamp posts. In this connection, it might be interesting to mention that in the borough of Westminster they had now some powers for attaching lamps to buildings. He looked forward to the time when lamp-posts would be abolished altogether.

The CHAIRMAN asked others who proposed to contribute to the discussion to make their communications in writing to the Secretary.

Mr. HARRISON, replying on the discussion, said he was very pleased Dr. Clayton Sharp had let him down so lightly. With regard to specifying street lighting requirements on a basis of minimum horizontal illumination, all he claimed was that the scientific soundness of the method could not be disputed. He realized that it was not always possible to put this into practice. As to the difficulty of measuring 0·01 foot-candle, in street lighting it was not a question of great accuracy. If they worked within 10 p.ct. it was quite enough. The longitudinal system was not entirely new; it was described by him in a paper read before the Society as far back as 1905. He did not advocate the system for streets with high buildings with beautiful facings, which should undoubtedly be illuminated. In Oxford Street (London) he had helped to devise a system which allowed for the illumination of the buildings as well. While on this part of the subject, he would remind all lighting superintendents that it was their bounden duty not to forget the slums. In devising schemes for the improvement of public lighting, the poorer districts must not be neglected. It was very interesting to hear that in the borough of Westminster they were getting powers for fixtures on buildings. There were great possibilities in this direction. He personally had never advocated rows and rows of posts. The question of fixtures on buildings would have to be more seriously gone into; and he thought it would open up many paths to economy and artistic effect.

Town Gas as a Cutting Agent.—Mr. D. R. Lane, in the "Gas Age-Record," describes the application of town gas in a Pacific Coast shipyard, where war craft are being broken up. The gas is burned in cutting torches with oxygen; and the commercial practicability of the process for such a purpose has been established thoroughly. Town gas was, in fact, adopted after a series of tests which resulted in apparent important advantages for it over the two other gases available—hydrogen and acetylene. These advantages include faster cutting on the grades and sizes of material encountered in the obsolete vessels being cut-up; the cut is wider, and is free from slag; and, most important, the heat-treated laminated steel armour plate in the ships was cut up by the town gas-oxgyen flame without spalls flying off and endangering workmen. The speed of cutting was considerably more, and the cost slightly less, than with the other gases. Two things were believed to contribute to these results—the availability of an unusually large supply of town gas through a high-pressure main, and the use of a special cutting torch. The pressure in the main was about 25 lbs.; but the gas was burned in the torches at approximately one-third of this. The necessity of using a large amount of oxygen in the cutting stream is thought to account for the rapidity with which the cut can be made, and for its width (about $\frac{3}{8}$ in.). Directly or indirectly, this larger flow of oxygen also is believed to be the cause of the cut's freedom from slag. The oxygen is used at approximately the pressures maintained when it is used with other fuel gases in cutting torches—30 to 35 lbs. when working on thin material, and 80 lbs. or more when working on heavy stuff. No satisfactory explanation has been advanced for the ability of the process to cut the heat-treated laminated plate without the occurrence of spalls. The town gas process has had little application so far in the cutting of very heavy material, and none whatever in the cutting of thick armour plate; and whether the system can hold its own in all-day competition with oxy-acetylene or oxy-hydrogen cutting, Mr. Lane says, remains to be seen. This doubt as to the adaptability of the process to cutting heavy material is due to the shortness of its flame, which is wide and thick in comparison with the flames produced by other gases, less complex chemically.

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REGISTER OF PATENTS.

Gas-Heated Sectional Heaters.—No. 176,760.

SOCIÉTÉ FRANCAISE DE CHALEUR ET LUMIÈRE, of Levallois-Perret.

No. 34,683; Dec. 23, 1921. Convention date, March 9, 1921.

This invention relates to gas-heated sectional heaters of the type comprising a plurality of separate vertically disposed sections, which are combined and clamped together between two side sections to form a complete unit. The main object is to provide a compact heater with improved means for causing circulation of the water, making the heater especially adaptable for the heating of water for external circulation or for the generation of steam, and readily convertible from one type of boiler to the other.

In this month's issue of "The Gas Salesman," we give a short description and two photographs of the boiler to which this specification would appear to refer; and here we shall merely quote from the claims, which include:

A gas-heated sectional heater, adaptable for the heating of water for external hot-water circulation or for the generation of steam, composed of a plurality of vertical sections each having a base inclined to the horizontal and means extending substantially parallel to the base for dividing the interior of the sections into superimposed inclined chambers communicating with each other in the section at the front and back thereof. The sections are clamped together and positioned above suitable burner jets to form a complete unit.

The lower faces of the sections are convex; and the interior of each section contains a baffle plate and inclined cross ties.

Elements of refractory earth are arranged intermediate to the sections.

Aluminium for Gas-Heated Coppers.—No. 188,572.

WATSON, J. H., of Burnley.

No. 34,548; Dec. 22, 1921.

This invention consists in furnishing the ordinary copper gas-boiler, which is used for domestic and for industrial purposes, with an external casing or jacket, with a lid, and with legs or standards, the whole of which items are or can be made of aluminium. The advantage claimed for this form of construction is that aluminium is practically non-corroding and rustless, thus indefinitely prolonging the life of any such gas-boiler to which it may be applied, as it is commonly known that the length of such life is generally determined by the length of time that the casing and lid last.

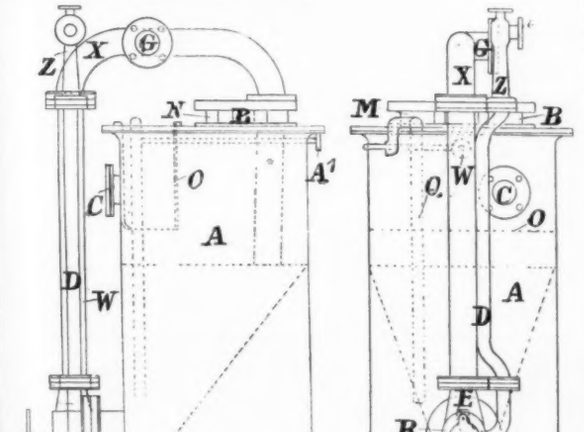
Apparatus for Neutralizing Wet Sulphate of Ammonia.—No. 188,587.

ROYSTON, G., of Barnsley,

No. 712; Jan. 10, 1922.

This invention relates to apparatus for neutralizing sulphate of ammonia in its wet state by circulating the acid salt in the apparatus with ammonia by means of an injector, and subsequently allowing it to run out or discharging it by steam.

The construction of apparatus according to the invention is clear from the elevations reproduced; but it may be noted that the tank is made with a bottom shaped as an inverted truncated oblique cone, which is shown dotted in the drawings.



Royston's Sulphate Neutralizing Apparatus.

Mother liquor containing sulphate of ammonia in suspension is ejected direct from the saturator through mounting on the top cover plate into tank A. The sulphate is allowed to settle in the tank, and the mother liquor overflows through pipe C and goes back into circulation. This proceeds until the precipitated sulphate reaches the overflow pipe C. The filling operation is then stopped; and if there is any liquor remaining on the top of the sulphate, this is rinsed-off with water from connection N. The steam is then turned on to injector Z, which draws ammonia gas from the still vapour pipes. The steam and ammonia gas is forced down pipe D and to circulating injector E, forcing the sulphate from box R up and round circulating pipes, down the seal pipe W and X, into tank A again. This continues until all the acid content of the tank is neutralized.

In this manner every atom gets its portion of ammonia. The fumes and steam which are used in this operation are sealed away from the atmosphere of the sulphate house by seal curtain O into the space between the sulphate level in the tank and the top cover plate, and are taken away through mounting M into a vent pipe. Steam pipe G is used, when the sulphate is heavy, to agitate it. When the batch of sulphate is neutral (which is determined with tests taken from the open top portion formed by the seal curtain O), the ammonia gas is shut off from the injector Z and outlet valve F is opened. The sulphate is then allowed to run out into the dryer. This is termed self-discharging.

If the sulphate is to be steam discharged, steam is injected, by injector E, up pipe W, and out of branch G, which would in this case be fitted with a valve, as is outlet F. When tank A is empty, valve F is closed, steam shut-off at injector Z, and the tank A again filled with acid sulphate from the saturator. The sulphate carried past branch G keeps the contents of the tank moving.

Automatic By-Pass Apparatus.—No. 188,608.

SCHINDELER, M., of Liège.

No. 5216; Feb. 22, 1922.

This invention has for its object to provide an improved by-pass apparatus for fluids, which shall open a passage for the flow through a conduit on the occurrence of a rise in pressure on the up-stream side of the apparatus or of a drop in pressure on the down-stream side. In installations comprising a gasholder, the apparatus may be arranged on a shunt conduit of this holder between the feed pipe and the discharge pipe leading to the consumers' main.

The patentee remarks that apparatus of the kind has generally comprised a chamber constituting inside the apparatus a continuation of the portion of the conduit situated on the up-stream side of the apparatus, and arranged inside a second chamber which constitutes a continuation of that portion of the pipe situated on the down-stream side of the apparatus; the communication between these two chambers being effected by means of an aperture which is adapted to be closed by a piston whose movements are caused by variations in the pressure.

According to the present invention, this aperture is closed by two movable devices—namely, a cylinder provided with ports, and a piston situated inside this cylinder. Both are carried by rods attached to diaphragms; and the arrangement is claimed to function upon pressure variations on either side.

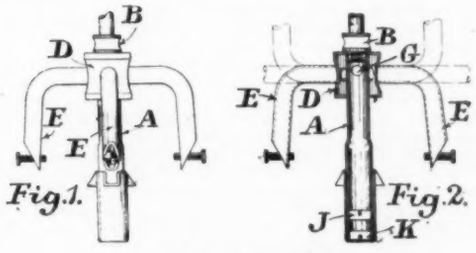
Incandescent Burners.—No. 188,726.

FRANCE, G., of Manchester.

No. 19,401; July 19, 1921.

This invention relates to incandescent lighting apparatus of the type wherein an inverted burner nozzle is arranged at the end of a pendant central tube at the top of which is arranged the gas-jet. A series of outwardly splayed tubes depend from a casing surrounding the central tube to form a support for the globe gallery and to form air conduits opening into the central tube. The object of the invention is to provide an improved construction form of such apparatus.

Fig. 1 is a side elevation of an inverted burner constructed according to the invention; and fig. 2 is a cross sectional view with modified forms of air conduits shown in dotted lines.



France's Incandescent Burner.

A metal tube A, slightly enlarged at the bottom end, is screw-threaded at the top to receive a gas-nipple B adapted to be attached to the chandelier or supply pipe. The top of a cylindrical casing D is clamped between the nipple and the top of the pipe A, which enters through a hole formed in the bottom of the casing D.

Extending radially from the casing D are three radially disposed tubes E bent downwardly; the extreme ends being cut to an angle and provided with set screws by means of which the globe is suspended. The tubes E constitute conduits up which air passes to the chamber D surrounding the top of the pipe A; and after being heated, the air passes through the holes G into the tube A.

The tube A is enlarged at the nozzle end, and is provided with an outer sheathing formed with projections to support the mantle. Within the tube are two sets of crossed vanes J, K, spaced apart and set in staggered relationship one to the other, whereby an efficient commingling of the gas and air is effected without unduly impeding the flow.

It will be understood that the air conduits E may be bent in any direction, as indicated in dotted lines in fig. 2.

An engine attendant at the Eclipse Cabinet Works, Alcester, was burned about the face and neck as the result of an explosion which occurred while he was starting a gas-engine.

MISCELLANEOUS NEWS.

THE THERM INQUIRY.

(*Continued from p.* 749.)

Second Day—Monday, Dec. 18.

THE LONDON COUNTY COUNCIL'S POSITION.

Mr. VALENTINE BROWN (for the London County Council) at this point referred to the position of the Council. In December, 1919, after the publication of the Fuel Research Board's report respecting the therm system, the Council passed the following resolution:

(*a*) That the Council approves generally the recommendations of the Fuel Research Board on Gas Standards as revised on Oct. 28, 1919, at a conference at the Board of Trade between representatives of the several interests involved.

(*b*) That the foregoing resolution (*a*) be communicated to the Board of Trade, and that the Board be asked to use its influence with the several gas companies supplying within the area of Greater London to secure the adoption by them of a uniform calorific standard for gas in such area.

Thus the Council, as the gas authority for London, had approved of the introduction of the therm system. The introduction of the system, however, was followed by a large number of complaints from consumers, some addressed to the Council and the Metropolitan Borough Councils, and many others addressed to certain newspapers, which had devoted considerable space to the subject. He had some seventy letters which had been sent to the Council. These included strong protests against the therm system from the Hammersmith Borough Council and the Hammersmith Guardians (the former of whom had pressed the Council to ask for a Board of Trade inquiry), and a request by the Kensington Borough Council that the London County Council should consider making representations to the Board of Trade as to the system. Communications from private persons included a petition from the National Citizens' Union (Islington Branch), with about 550 signatures, protesting against the "present exorbitant and unfair charge for gas," and demanding a return to the former system of charging. and a resolution passed unanimously by the City of Westminster Ratepayers' and Leaseholders' Association, strongly protesting against the therm system.

In view of the considerable expression of dissatisfaction, in the Press and otherwise, the Council had considered it their duty to ask for this inquiry, in order that the practical working of the therm system might be tested, and any public misconception on the subject might be removed. The Metropolitan Boroughs Standing Joint Committee, representing all the Borough Councils, had written to the Council supporting their request for an inquiry. The Council had authorized two of their chief officers (the Comptroller, and the Chief Officer of the Public Control Department) to give evidence before the Committee. In addition, according to the wish of the Committee, the Council had invited a few representatives of the consumers who had sent letters of complaint to attend and explain their difficulties. Seventeen of these were written to by the Council, and eleven replies were received; those who did not reply including the National Citizens' Union representative, who had forwarded the petition referred to. In the result, eight complainants had promised to attend, and the attendance of a ninth complainant was uncertain. The complainants had been selected from the areas of four Companies, and an outline of their grounds of complaint had been supplied to the Companies. In conclusion, Mr. Brown added that the Council would be glad to assist the Committee in any other way that might be indicated.

The CHAIRMAN asked whether the Council had let the respective gas companies know all the particulars of the complaints.

Mr. BROWN replied that he had communicated with the gas companies concerned, so that they would be in a position to answer questions.

The CHAIRMAN said he took it that the Council raised no objection to the therm as such, but only required investigation as to the method of charge, and the charge made for gas.

Mr. BROWN said that followed.

Mr. CAMPBELL COOPER (Gas Companies' Protection Association) asked for the names of the four companies.

Mr. BROWN replied that they were the Gas Light and Coke Company, the South Metropolitan Company, the Wandsworth Company, and the South Suburban Company.

Mr. CHARLES DAVID JOHNSON (Comptroller of the London County Council) then gave evidence. The Comptroller of the Council, he remarked, was concerned with the accountancy side of the subject, including the question of the "standard" or "basic" price and the sliding-scales of price and dividend. The Council had received a number of letters from gas consumers [The CHAIRMAN: 70] complaining of increase in their gas bills, and in many cases alleging, or at least suggesting, that the increase was attributable to the new method of charging for gas on the thermal basis. The complaints were, in the main, based on a comparison between the charges for the quarter ended June 30, 1922, and the corresponding quarter of the previous year. The increase in cost did not appear to have been due, in all cases, to an increase in the prices charged, as in the case of four out of the six gas companies supplying in London the price charged was lower in the quarter ended Midsummer, 1922, than in the quarter ended Midsummer, 1921. In the cases of the South Metropolitan and the Wandsworth Companies, the price was increased by 1d. per therm, and in the Gas Light and Coke Company's area, south of the Thames, the price was increased by about 1¼d. per therm. In the area where there was no increase of charge, any increase in cost must obviously be due to increased quantities of gas passing through consumers' meters. In individual cases the increase might be due to defective meters; but this cause could not account for the general increase in cost. There were certain reasons why increased consumption might be expected in the quarter to Midsummer, 1922, as compared with the corresponding quarter in 1921. During the whole of the Midsummer quarter in the year 1921, the coal industry was at a standstill, and consumers were urged to economize in the use of both coal and gas. Reduction of consumption was made the more easy by the fact that the weather during a great part of that period was exceptionally dry and warm. Such conditions would naturally result in low consumption. On the other hand, the weather during the Midsummer quarter of 1922 was of a character to induce increased consumption of gas.

In order to show whether the Council's experience as a consumer corresponded with that of the complainants, the amounts paid by the Council to the six London Gas Companies in respect of the gas consumed on its various premises during the Midsummer quarters of 1920, 1921, and 1922 were given. The figures showed substantial increases between 1921 and 1922; the comparative figures being in total £18,622 and £20,387. In one case—that of the Commercial Gas Company—the payments decreased; but the decrease in the amount paid (£2798 against £3155) was accounted for by the reduction from 1s. 1·8d. to 1s. in the price per therm in the case of this Company. In view of the large number of the Council's properties, it had not been practicable to make in detail an exhaustive comparison between the two periods; but the figures for 100 schools had been extracted and examined. The general trend was for consumption to fall in 1921 as compared with 1920, and to increase in 1922. The thirty schools selected in the South Metropolitan Company's district showed an increase in 1921 over 1920; but an examination of the schools in detail showed that there were special reasons for this. The use of school buildings varied somewhat from year to year. In any case in which the increase in 1922 over 1921 was abnormal, satisfactory reasons had been forthcoming. Similar investigations had been made in regard to certain other services. On the information obtained, said Mr. Johnson, there was no reason to attribute the increased amount of the gas bills to the change in the basis of charge from volume to heating power. In the opinion of witness, the main cause of the public dissatisfaction was the fact that the introduction of the new basis coincided with an increase in the standard prices, which had enabled the companies to charge higher prices than they would otherwise have been entitled to. The object of the provisions of the Gas Regulation Act, 1920, in regard to the revision of standard prices, was to place the companies, as far as practicable, in the same position, as regards dividend-earning power, as they were in before the war. The revision of the standard prices took place at a time when costs were at about their highest point, and it was open to question whether the revised standard prices were not fixed at too high a level. In any case, having regard to the decline in costs indicated by the recent fall in the prices actually charged by the various companies for gas, it would appear that the standard prices per therm should be revised, with a view to a larger proportion of the saving in costs due to circumstances beyond the control of the companies being secured to the consumers. The following table, showing the prices charged in 1913 and those charged at the present time, was handed in. The present prices were shown in terms of volume in order to facilitate comparison with the 1913 prices. The table also showed the dividends authorized and paid in 1913, compared with those authorized with gas at present prices. In all cases the authorized dividends allowed by the present prices are considerably in excess of those paid in 1913; while the prices charged for gas are also very much in excess of pre-war prices.

Comparison between Prices and Authorized Dividends for 1913 *and the Present Time (December,* 1922).

Company.	Prices per 1000 C.Ft.		Dividends Authorized.	
	1913.	Present.	1913.	Present.
	s. d.	s. d.	P.Ct. £ s. d	P.Ct. £ s. d.
Commercial . . .	2 4	3 11·5	5 9 4	7 12 0
			5 6 8	8 0 0
Gas Light and Coke .	2 6	4 2	4 17 4	7 4 0 (*b*)
	2 2 (*a*)			
South Metropolitan .	2 2	4 8	5 9 4	.. (*c*)
Brentford	2 5	4 2·6	5 12 0 (*d*)	7 8 0
	2 4		5 10 0 (*d*)	7 15 0
South Suburban . .	2 3	4 10·9	6 0 0 (*e*)	6 16 8
Wandsworth, &c. . .	1 9	3 6·3	8 7 6	9 15 0
(Wandsworth District)			6 17 6	8 5 0
			5 17 3	6 16 6

(*a*) South of Thames. (*b*) Approximate dividend payable after allowing for increased contribution to Redemption Fund. (*c*) No specific dividend authorized. (*d*) Equivalent rates after allowing for conversion of capital in 1915. (*e*) £5 3s. 4d. p.ct. on West Kent stock.

Witness was unable to say to what extent the saving in costs, which had enabled prices to be reduced, and consequently had entitled the Companies to pay increased dividends, was due to circumstances beyond the control of the Companies; but he considered that, at any rate, there was a *prima facie* case for a reduction of the standard prices, and it was the intention of the Council to make application to the Board of Trade, in due course, for a revision of the standard prices. He suggested that the Committee should inquire as to the extent to which steps had been taken by the various companies to ensure that the appliances of their consumers had been adjusted to secure the maximum value of the gas supplied to them when the calorific value was altered, in view of the provisions of section 1 (4) of the Gas Regulation Act. He also invited the Committee and the Companies to consider whether it would not assist the consumer to understand his gas bills, and help to give him assurance in regard to the change of system, if the volume of gas registered as well the number of therms charged for were shown on the demand. It was already done by some companies.

Asked whether it would not be better if the County Council took an interest in the appliances, Mr. Johnson said he thought it would, but that it would require legislation.

Mr. BALFOUR, questioning witness, asked whether he had reason to believe that if the industry reverted to the 1000 c.ft. basis of charge, there would be a reduction in the price of gas.

Mr. JOHNSON said he had not. The change had nothing to do, in his opinion, with the price of gas.

Asked why, if the price were too high, the London County Council had not made an application to the Board of Trade before the inquiry, witness said it was at present a little premature; but he did not think it would be long before an application was made.

Mr. BALFOUR, having ascertained that the dividends referred to in the table were subject to income-tax, remarked that, in view of the very high income-tax, the dividends were still very small.

Mr. JOHNSON said that applied to everybody.

Mr. BALFOUR thought not quite; gas companies' dividends were restricted by Act of Parliament, and they had not been too high, taking them as a whole. Other concerns, if they made a profit, could distribute more when income-tax was high.

Mr. JOHNSON agreed, but pointed out that other concerns had not the monopoly advantages of the gas companies.

Mr. BALFOUR said he knew about that.

Sir JAMES MARTIN asked whether witness agreed with a statement made by Mr. Honey at the previous sitting, that any child from an elementary school could convert the price from so much per therm to so much per 1000 c.ft.

Mr. JOHNSON did not agree. Some of the consumers, who had left school some time, could hardly be put on the level of the child at present at school. It was the man who was not at school who had to pay the bill, and who had not, perhaps, the child to make the calculation for him; and it was necessary that the facts should be made clear to him. This was a contributory cause of the dissatisfaction.

Replying to Mr. WOOLCOCK, witness said that no doubt the trouble had occurred because consumers' bills had gone up, and they did not understand why. Naturally, they had assumed it due to the therm.

Mr. WOOLCOCK asked whether, if the dissatisfaction was not due to the change from the illuminating to the thermal standard, it had anything to do with the accountancy side of the subject, including the basic price.

Mr. JOHNSON thought it was to some extent due to this. The Council had put their views before the Board of Trade. The standard price fixed by the Board was fractionally higher than the Council had thought it should be at that time; but the fraction of difference then was comparatively small. He believed the Board of Trade would agree, judging from Mr. Honey's evidence, that there was not the same reason now for allowing the increase in the standard price which existed when it was fixed, eighteen months ago.

Mr. WOOLCOCK suggested that the Council were substantially satisfied with what the Board of Trade had done at that time.

Mr. JOHNSON would not put it so high as that; but the difference was not enough to make a fuss about.

Replying to further questions, witness said that when the decision of the Board of Trade as to standard prices was declared, it was pointed out by the Council to the Board that, in connection with the application of the Gas Light and Coke Company for an Order under section 1 of the Gas Regulation Act, the Company would be entitled to declare a dividend higher than would otherwise be the case.

Mr. D. MILNE WATSON (Gas Light and Coke Company) asked whether Mr. Johnson was aware that the Company's dividend in 1921 was, in total amount, less than in 1913.

Mr. JOHNSON said that meant dividends paid, not dividends authorized.

Mr. MILNE WATSON pointed out that it was only the dividend actually paid that could possibly affect the price.

CONSUMERS' EVIDENCE.

A number of consumers who had complained with regard to their gas accounts then gave evidence.

Miss IRENE MANBY (Managing-Director of the Ladies' National Clubs, Ltd., Knightsbridge) said the Company had a number of establishments in London, supplied by the Gas Light and Coke Company. Witness had not been able to go into the gas accounts of all these places, but drew attention to the very large increases in the accounts for the March and June quarters, 1922, at No. 47, Barkston Gardens, and for the June quarter, 1922, at Nos. 7 and 41, Barkston Gardens. At the former of these establishments the gas account for the March quarter, 1921, was £54 4s. 7d., and for the March quarter, 1922, £65 17s. 9d. For the June quarter, 1921, it was £35 7s., and for the June quarter, 1922, £47 2s. At No. 7, Barkston Gardens, the account for the June quarter, 1921, was £9 17s. 10d., and for the corresponding quarter of 1922, £34 4s. 9d. At No. 41, Barkston Gardens, for the June quarter, 1921, the account was £27 13s. 5d., and for the June quarter, 1922, £42 2s. 1d. At No. 7, Barkston Gardens the conditions were the same; there being the same number of appliances used and the same number of residents.

The CHAIRMAN thought it might be that some of the meters in the rooms had not registered properly.

WITNESS: Who is to know?

The CHAIRMAN pointed out that witness could have got the London County Council to test them.

WITNESS: Why should I?

The CHAIRMAN said that if there were a big difference in the bills, there was a reason.

On examination of the meter card, the Chairman said that it was confusing.

Mr. F. W. GOODENOUGH (Gas Light and Coke Company) explained that in the June quarter of 1921 the change had taken place, and the gas had been charged for part of the time per 1000 c.ft., and for the remainder per therm.

Asked to explain why the bills were higher in 1922, Mr. Goodenough said that more gas had been burned, as registered by the meter. He was ready to go into the figures. He also pointed out the difference in the weather during the June quarters of 1921 and 1922. Where meters were read monthly as well as quarterly, it was found that the consumption during April and May of this year was above the normal, owing to the cold weather; but in June the consumption was practically normal. He agreed with witness that there was a hot spell in May this year. But there was also some very cold weather; and he gave average temperatures in support of this.

The CHAIRMAN: It seems a question of checking the meters.

Col. ERNEST BLUNT, C.B., said he occupied a flat at No. 87, Ashley Gardens, S.W. Gas was supplied by the Gas Light and Coke Company. There were five gas-fires and a gas hot-water circulator. He was most careful as regards consumption. He could not account for the large increases registered, particularly the enormous increase in consumption as between the June quarters of 1921 and 1922—namely, from 17,600 to 43,400 c.ft. He pointed out that his meter was renewed shortly before the large increases began. The quarterly consumptions of gas from 1918 to 1922 were as follows:

		C.Ft.	
March quarter,	1919	19,600	Average per quarter, 22,700 c.ft.
,, ,,	1920	21,200	
,, ,,	1921	26,000	
,, ,,	1922	24,400	
June quarter,	1918	15,000	Average per quarter, 15,200 c.ft.
,, ,,	1919	15,600	
,, ,,	1920	12,600	
,, ,,	1921	17,600	
,, ,,	1922	43,400	
September quarter,	1918	9,000	Average per quarter, 10,700 c.ft.
,, ,,	1919	7,800	
,, ,,	1920	12,000	
,, ,,	1921	10,800	
,, ,,	1922	13,400	
December quarter,	1918	13,100	Average per quarter, 22,200 c.ft.
,, ,,	1919	17,800	
,, ,,	1920	19,800	
,, ,,	1921	32,400	
,, ,,	1922	28,200	

Mr. GOODENOUGH stated that Col. Blunt had seven gas-fires, and not five, and one additional gas-fire was put in on March 1 of this year, which may have accounted for the increased consumption in the June quarter. The old meter had been taken out and had been found correct. The one that had registered the consumption of 43,400 c.ft. in the June quarter of 1922 was a new one, which had been tested before installation. The only explanation could be that more gas had been used, owing to the cold weather.

The CHAIRMAN said it was difficult to see any other explanation.

Mrs. F. M. FISCHER (No. 11, Zenobia Mansions, Queen's Club Gardens, W. 14) said that gas was supplied by the Gas Light and Coke Company, and was used for cooking and for two gas-fires. The gas accounts for the two quarters complained of were as follows:

		C.Ft.
March quarter, 1920	£5 0 8	22,200
March quarter, 1921	£4 5 5	14,600
March quarter, 1922	£9 18 3	36,400
June quarter, 1920	£2 2 2	9,400
June quarter, 1921	£2 9 0	8,200
June quarter, 1922	£7 15 1	29,400

There was no alteration in conditions in the quarters of which complaint was made. The same number of stoves was used, the same number of the family was resident, and there was no domestic help employed.

Mr. GOODENOUGH stated that in the June quarter of 1921 it had been found that the meter had ceased to register.

The CHAIRMAN said that in this case it would appear that it was more a matter of congratulation for the consumer.

Mrs. FISCHER added that in September, 1921, the gas bill was £2 6s. 5d., and in September of this year it was £2 13s. 3d.; so that it was nearly normal again.

Mrs. SOPHIE CRAWFORD LOMAS (of No. 51, Herne Hill, S.E. 24), said that gas was supplied by the South Metropolitan Company, and the consumption, as shown by meter card and accounts, was:

	Therms.
Quarter to Lady Day, 1921	47·30
,, ,, Midsummer, 1921	30·25
,, ,, Michaelmas, 1921	23·65
,, ,, Christmas, 1921	91·30
,, ,, Lady Day, 1922	205·15
,, ,, Midsummer, 1922	68·20

Gas was used for cooking and for four gas-fires, three of which were in bedrooms and only occasionally used. Electricity was employed for all lighting. The enormous increase in the account for the last two quarters shown could not be explained.

Mr. ALBERT STOKES (South Metropolitan Gas Company) remarked that witness was comparing like with like, because the Company had been supplying gas under the therm system since September, 1920. Mrs. Lomas had had the gas-meter tested, and it had turned out to be 6 p.ct. fast. It was tested after the large consumption registered in the quarter to Lady Day, 1922.

The CHAIRMAN said that the gas had passed through the meter, and asked whether witness was sure there had been no waste.

Mrs. LOMAS replied that she was quite sure. There was a danger of the calculation not being done correctly.

The CHAIRMAN said that in future she would have the figures both in cubic feet and in therms.

Mr. FREDERICK JAMES THOMAS (of No. 85, Louisville Road, Upper Tooting, S.W. 17), supplied by the South Metropolitan Company, said the gas consumption was as follows:

	Therms.
Quarter to Lady Day, 1921	214·50
,, ,, Midsummer, ,,	86·35
,, ,, Michaelmas, ,,	52·25
,, ,, Christmas, ,,	223·30
,, ,, Lady Day, 1922	256·30
,, ,, Midsummer, ,,	126·50
,, ,, Michaelmas, ,,	69·44

Gas was used for cooking and for four gas-fires, two of which were in bedrooms. Electricity was employed for lighting. Mr. Thomas had complained of his meter, and the Company had it removed in October and replaced by another. The London County Council had reported that the meter was accurate. Although not professing to have expert knowledge, Mr. Thomas suggested that as it was impossible, with the

usual domestic appliances, to avoid some percentage of loss in consumption, it would be better for the consumer if he could be supplied with a less rich and costly gas, which would still answer all reasonable purposes; for the unavoidable wastage would not be so expensive. As meters could only register the volume of the gas, Mr. Thomas failed to see why it was necessary to convert it into some other formula for the purpose of assessing the charge.

The CHAIRMAN said the main point made by witness seemed to be that the gas was too rich. He did not think there was anything wrong with the figures.

Mr. STOKES said some of the apparatus used in the house was supplied by the South Metropolitan Company, and had been adjusted to burn a gas of 560 B.Th.U. at the time they were supplied.

Mr. THOMAS pointed out that one of the gas-fires had been in the house for nine or ten years.

Mr. STOKES replied that the gas was not altered during that time, except for a very short period during the war. He wanted to emphasize the fact that the gas supplied now was exactly the same as that supplied before the war.

It was intended that other consumers who had complained should also give evidence; but they did not answer when their names were called, and the Chairman remarked that if they did not attend the meeting he could not hear them.

EVIDENCE BY THE SHEFFIELD GAS CONSUMERS' ASSOCIATION.

When the Committee re-assembled after lunch, evidence was given on behalf of the Sheffield Gas Consumers' Association.

Dr. R. S. HUTTON stated that the Association was constituted by the industrial gas users in Sheffield. There were 75 members, and the consumption of gas for power in a normal year was something like two-thirds of the total output of the Sheffield Gas Company. It was now considerably less than that, because of trade conditions. He believed there was no other gas consumers' association in the country.

The CHAIRMAN remarked that the Committee were anxious to get into touch with any others there might be.

Dr. HUTTON said the Association thoroughly approved of the therm system on account of the better guarantee it gave to the consumer of the maintenance of a standard quality; and their own experience in Sheffield led them to look forward to that benefit being fully developed as soon as the Gas Referees had been able to complete their system of control and apply it to the use of recording gas calorimeters. Hitherto, in the Provinces, the control had been very much less developed than in the Metropolis. It was felt that the recording calorimeter would be extremely helpful when it came along. The present grievances had been brought about as a cumulative effect of a series of changes in the standard quality; there being a lowering in some cases accompanied by an increase in the charge which had been hidden from the consumer, and also on account of the technicalities of the subject. In other words, the price had gone up without the public's perceiving it.

Asked as to the steps which the Association had taken in regard to the matter generally, Dr. Hutton said the body was formed during the war to watch over the interests of the industrial consumers of gas who were not versed in the technicalities of the subject. Through one of their members, they had taken a continuous record, by means of recording calorimeters, of the Sheffield gas for 5½ years; and he handed in an example of the monthly record sheets so obtained. These tests had been taken for their own enlightenment, without, of course, any assistance from the Gas Company. It was not suggested that these tests were all that was really required; but it was alleged that they made it plain that the recommendations of the Fuel Research Board had not been adhered to. The recommendations made at the conference of the Fuel Research Board, the Board of Trade, the London County Council, and the gas industry, in October, 1919, were adhered to in the Gas Regulation Bill when it was first drafted; but when the Bill came before Parliament, the recommendations, particularly that with regard to inerts, were not adhered to. The Sheffield Gas Consumers' Association suggested that this was due to the fact that the matter had passed out of the hands of the Fuel Research Board (which was a technical and scientific body) into the hands of the officials and people of the Board of Trade who had not that same technical and scientific knowledge and experience.

The CHAIRMAN: Is it your belief that the existence of the inerts in the gas now supplied increases the charge to the consumer?

Dr. HUTTON said in some cases this had been the result, and in Sheffield it had resulted in a very considerable increase.

Asked by the CHAIRMAN to develop this point, who put it that if the thermal units only were paid for, the percentage of inerts could not increase the price, Dr. Hutton said that at Sheffield a large proportion of the gas was made by the straight coal gas distillation process, and the percentage of inerts had a considerable effect, inasmuch as the apparatus had either to be continually adjusted or inefficient use resulted. He doubted whether to day in Sheffield the necessary adjustments had yet been completed. In 1910, the standard in Sheffield was 16½ c.p., on the Sugg burner test. In that same year the Gas Company obtained powers to reduce it to 14 c.p., tested by the "Metropolitan No. 2" burner. This was actually a greater reduction than it appeared, because what gave 16½ c.p. in the Sugg burner gave 20 c.p. in the "Metropolitan No. 2" burner. This was one of the points certainly not made clear to the ordinary user. In 1916, the Gas Company obtained powers to substitute a calorific power value for the illuminating standard—a good enough change in itself; but a reduction from 560 B.Th.U. to 500 B.Th.U. was not exposed at the time. In 1921, under the Gas Regulation Act, there was a reduction to 480 B.Th.U.; and at the same time there was an increase in the price, which was hidden by the change to the therm system. On July 1, 1922, the Company increased their calorific value to 500 B.Th.U.—a change, by the way, added witness, which the Company had strenuously opposed the year before, when the Association had asked for that value, it being then stated by the Company that such a figure was quite impossible.

Answering further questions by the CHAIRMAN, Dr. Hutton said the Association had no powers to take any action, except through the Local Authority, to get a revision in any form, and it had been very difficult to convey to the Local Authority the technicalities of the subject which the members of the Association were trying to understand themselves. Records of the calorific value of the gas in Sheffield since 1910 had been taken; but they were unofficial tests. The average in that year was 625·8 B.Th.U., so that a drop to 480 was a considerable one. It was 500 B.Th.U. now.

The CHAIRMAN: What you complain of now is the price?

Dr. HUTTON: The price and the fact that we have not yet obtained a sufficiently uniform quality of gas.

Mr. J. IMRIE, F.I.C., was the second witness on behalf of the Sheffield Gas Consumers' Association; and the cross-examination of the two witnesses by the Members of the Committee was taken together subsequently. In the first place, Mr. Imrie expressed the view that accounts should show the price per 1000 c.ft. as well as the price per therm, and he agreed that the form of account adopted by the Bristol Gas Company would meet this point. He then suggested that there was a disproportionate increase in cost under the therm system compared with the old cubic foot system.

The CHAIRMAN: That can be met by representations being made by the local authority.

WITNESS agreed.

The CHAIRMAN understood that the next point was that the gas companies had used the therm as a means of increasing their statutory dividends.

Mr. IMRIE said this had been the effect in Sheffield. The price of 9d. per therm which was granted the Sheffield Company as a standard was equivalent to 3s. 7½d. per 1000 c.ft.; and if the Company had asked for the latter price instead of the 9d. per therm, it would at once have been said to be ridiculous. The Company did not obtain that power by a Bill in Parliament, but through the Board of Trade under the Act.

Answering Mr. BALFOUR, Dr. Hutton said he would not suggest going back to the cubic foot system again.

Mr. BALFOUR: You think the public do really get more what they pay for on the therm system than on the cubic foot system?

Dr. HUTTON: Yes.

So that it is really a question of educating the public to the change?—Yes; and educating, in future, the public before the change—that is the trouble.

Asked as to the Bristol Company's form of account, Dr. HUTTON said that anything which gave information to the public would help.

Mr. BALFOUR then suggested that it might be worth stating the cost of gas per day to the consumer, when the quarterly account was rendered, although Dr. Hutton replied that a man ought to be able to make this calculation for himself from the account. It certainly would help if it were done, however.

Mr. IMRIE was then asked some questions with regard to the adjustment of fittings. He said there had been no adjustment of fittings in Sheffield since the change to the calorific value system. He thought this was leading to considerable waste, to the detriment of the consumers. It was added, in answer to further questions, that Sheffield was anxious to have cheap gas as a means of preventing the smoke nuisance. Up to 1914, great strides were being made in this direction, because gas was reasonably cheap; but now the cost was approximately three times what it was pre-war, and it was impossible to use gas-fired furnaces.

Giving the exact figures of the increase in price in Sheffield, Mr. Imrie said that, on the old candle-power standard, the calorific value was 550 B.Th.U., and the equivalent price per therm was 1·82d. In 1921, the price per therm was 9·2d. Both these figures related to large industrial users. The latter price had been reduced now to 6·2d. per therm. In the case of small consumers, the price had increased from the equivalent of 2 73d. per therm to 8d. per therm to-day—a slightly greater increase than in the case of the large consumers.

Witness agreed with Mr. Balfour that testing the quality of the gas was the vital point, apart from price, and that there were provisions for this in the Gas Regulation Act. So far as he knew, he believed these provisions were carried out; but it all depended upon the Local Authority. Whatever was done, was recorded in the minutes of the Council; but these minutes did not get into the hands of the general public, so that the public were not aware of what was being done. Perhaps it would be an advantage to have the Gas Referee's reports printed on the consumer's accounts. He believed the Association recommended something of the sort to the Board of Trade when the change was originally made; but nothing was done.

Mr. BALFOUR: It really seems now to boil down to this—that it is time somebody asked the Board of Trade to look into the revision of price.

Mr. IMRIE: We should be very happy if this could be done.

Dr. HUTTON was taken very carefully by Mr. Woolcock over the passage in the Association's evidence—given by Dr. Hutton himself—that the recommendations of the Fuel Research Board had not been carried out.

Dr. HUTTON said there was the question of the inerts, and there were also many other matters which were debated at the conference.

Asked to deal specifically with inerts, Dr. Hutton reminded Mr. Woolcock that the recommendation at the conference in question was that the percentage of inerts should be 20 p.ct. for two years, 18 p.ct. for a further two years, and then 15 p.ct. There was nothing about that in the Gas Regulation Act as it was passed.

Mr. WOOLCOCK: How is the customer prejudiced?

Dr. HUTTON: It is rather difficult to explain. Witness added that the customer was prejudiced in a place like Sheffield, where they had a straight coal gas, and the inerts before the war did not exceed 5 or 6 p.ct. During the war they were 50 p.ct.; and to-day they were from 25 to 27 p.ct. He admitted that he had not any recent figures, and referred to Mr. Imrie.

Mr. IMRIE said there were three gas-works in Sheffield, one of which supplied almost exclusively blast-furnace gas; and this had the lowest percentage of inerts of the three—viz., 9 to 10 p.ct.

Mr. WOOLCOCK pressed the point as to how the public had been damnified by the recommendations of the Fuel Research Board recommendations not being carried out. Was the consumer damnified because the recommendation as to 20 p.ct. inerts had not been carried into the Act?

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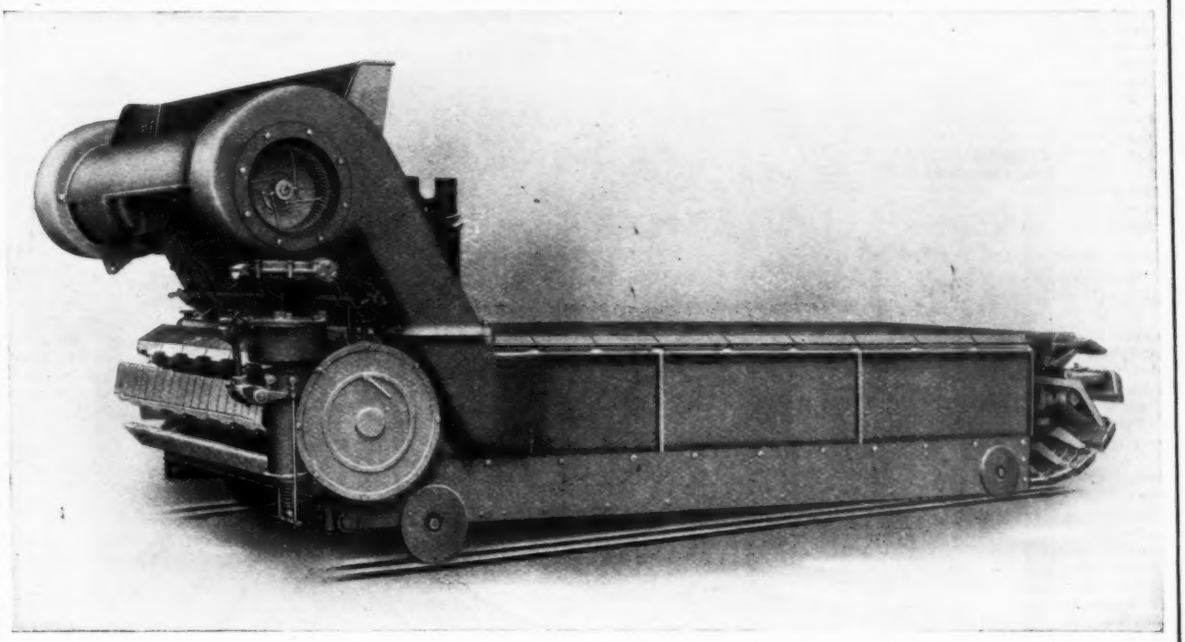

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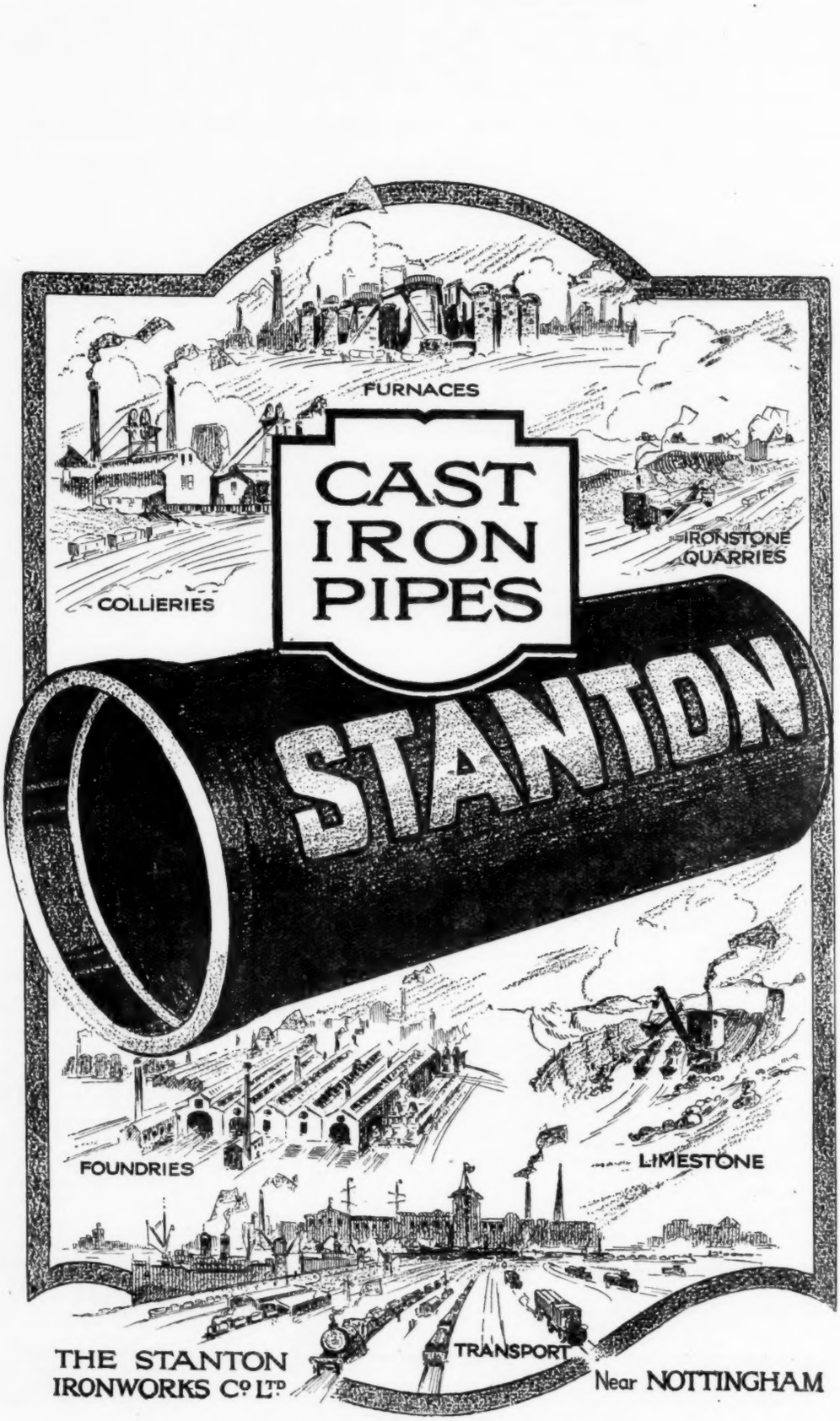
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Dr. HUTTON explained the point—that there had been installed in Sheffield a large equipment of industrial appliances and heating furnaces for a certain quality of gas containing less than 6 p.ct. of inerts. Now these appliances, which cost a considerable amount of capital, had to be used for a totally different gas containing anything up to 50 p.ct. of inerts, and recently over 20 p.ct.

Mr. WOOLCOCK: Is the answer this—that, by reason of the fact that there has been left out of the Gas Regulation Act a recommendation with regard to 20 p.ct. of inerts, the quality of the Sheffield gas is different from what it would have been?

Mr. IMRIE: Yes, it certainly is. The inerts at two of the Sheffield works are about 20 p.ct., and in other works about 10 p.ct.

Mr. WOOLCOCK reminded the witnesses of the Board of Trade Committee who dealt with inerts, who reported that there was insufficient evidence to justify maintaining the original recommendation of the Fuel Research Board, and suggested that the matter should be reviewed in three years.

In the course of further questions, Mr. Woolcock said it almost appeared that the complaint as to inerts was that the Fuel Research Board had recommended 20 p.ct., and at one of the Sheffield works they were getting 10 p.ct. [Laughter.]

Mr. WOOLCOCK then dealt with the statement in Dr. Hutton's evidence, that there had been difficulties because the Board of Trade officials had not the technical and scientific knowledge of the Fuel Research Board.

Dr. HUTTON suggested that Mr. Woolcock was taking the sentence differently from what was intended. The point was that the Fuel Research Board had made certain recommendations originally at a conference attended by all the interested parties; but these recommendations did not appear in the Bill as presented to Parliament, where the Association had neither the time, nor the patience, nor the energy to follow it right through.

The discussion was carried on for a while. The upshot of it was that Mr. Woolcock told Dr. Hutton that the Board of Trade had consulted with, and had taken the advice of, the Fuel Research Board, before sending the Bill forward.

Discussing the present position in Sheffield, as to variations in quality, Mr. Woolcock got from Mr. Imrie the admission that at present there was no fault to be found, although there had been in the past. At present there was only a variation of 10 to 15 B.Th.U. on the recording calorimeter at one of the three gas-works.

EVIDENCE FROM THE SUBURBS.

Mr. BURGESS, representing the North Mitcham Improvement Association and the East Mitcham Association, was then called. His manner all through was typical of the propagandist, and was not likely to impress a body of business men, such as the Committee, by the attitude he adopted—at any rate, at the beginning. The Chairman quickly sized-up the situation, and kept a very tight rein, and thus avoided a good deal of waste of time through a wandering-off into side issues and irrelevancies.

It was explained by Mr. Burgess that the North Mitcham Association had 1500 members, and had been formed to watch over the general interests of the ratepayers, and that an East Mitcham Association had been formed on similar lines. On Dec. 16, his Association had passed two resolutions—one, "That the therm system (*i.e.*, the sale of gas by heat measurement) is sound;" and the second, "The basis of charging by the therm requires adjustment."

Asked by the CHAIRMAN to speak to the second resolution, Mr. Burgess (who did not seem to appreciate why he should not be allowed to explain why the North Mitcham Association thought the therm system sound) said it was his opinion that the system of charging by the therm required adjustment in all its financial provisions. He agreed that there was a means of asking for a new standard price; but inasmuch as it had been admitted by the officials of the London County Council that morning that they had missed the opportunity—when the Gas Regulation Act was going through—of dealing with the price, he felt justified in asking the Committee to hear the point of view of the consumer, as he wished to put it. The Wandsworth, Wimbledon, and Epsom Gas Company supplied his area. Handing in a document to the Chairman, witness said it was clear that under the system of charging as at present the Company could considerably increase their dividend. It was difficult to follow the rather involved explanation given by the witness; but the effect of it was this—that under the old system of charging by the Company, taking gas at 3s. 6d., the 5 p.ct. Wandsworth "A" stock could pay 5¾ p.ct. Under the present conditions, the dividend could be 9¾ p.ct. In a second illustration, it was stated that with gas at 5s. per 1000 c.ft., a dividend of 3½ p.ct. could be paid; but under the new conditions 7½ p.ct. could be paid. In the case of the Commercial Gas Company, another illustration was given, the effect of which was that whereas under the old conditions a dividend of 4⅝ p.ct. could be paid on the 4 p.ct. stock with gas at 3s., under present conditions it could be 9⅛ p.ct.

The CHAIRMAN said that the figures he had before him did not bear this out. The Wandsworth dividend in 1913 was £8 7s. 6d., and to-day it was £9 17s. 6d. In the case of the Commercial Gas Company the 1913 figure was £5 9s. 4d., and to-day it was £7 12s.

Mr. BURGESS said he had taken imaginary cases, and had not dealt with the actual dividends paid. One of the reasons for the complaints to-day was that the standard price had been fixed too high, and money was now being paid in dividends over and above a fair return. He then referred to Command Paper 1380 by the Sub-Committee of the Board of Trade on Profiteering, in which attention was called to a possible evasion of the sacred principle of the sliding-scale. Again, the Gas Light and Coke Company had a special reserve of nearly £750,000 at the end of 1921. The consumer was suspicious of these financial manipulations and of the possibility of hidden reserves being created by the gas companies. Further, he urged that the whole matter of the charge should also be considered in relation to what was paid for the hire of fittings. No fewer than two-thirds of the population of Wandsworth used slot meters, and of the total charge of 1s. 0⅝d. per therm, no less than 3⅜d. was the charge for the hire of slot meter, stove, and fittings. Consequently, whereas the man who was fortunate enough to pay for his gas quarterly got 19s. worth of gas on a bill for 21s. (the difference being the meter rent), the poor man who had a slot meter only obtained 16s. worth of gas. His argument was that large sums of money were being paid by poor people for meter, stove, and fittings rents. "The curse of the poor is their poverty" wound-up Mr. Burgess, in a loud voice.

The CHAIRMAN: I am afraid that is a matter that does not come before the Committee.—Are we to gather from you that the standard price is too high?

Mr. BURGESS: Yes, and that the adjustment of it is not as automatic as it should be. Most people's wages are automatic enough if they are on the sliding-scale.

Continuing, Mr. Burgess said this was a matter which should not be left to local authorities who were just picking up the threads. In the case of the Local Authority in his district, there had been the greatest difficulty in getting them to appoint a gas examiner. It had now been done; but only under the greatest pressure. He had no information to offer the Committee as to whether the apparatus in his district was adjusted to deal with the calorific content of the gas economically and effectively; but he had very grave doubts as to whether it was so adjusted. He was afraid the consumers' interests had not been looked after in this respect in the manner they should. In his opinion, there should have been a change in the apparatus when the Act of 1920 came into operation; but from the evidence that had been given in the morning, this was not the case.

Asked whether he had received specific complaints, witness said that four public protest meetings had been held, and he had received specific complaints in that sense. He had been told by consumers that they would cease using gas as a protest against the condition of affairs; but he had always advised co-operation with the Gas Company.

A representative of the Wandsworth Gas Company said he would like to ask the witness whether the Wandsworth Company had ever paid the dividend of £9 17s 6d. which he had mentioned.

The CHAIRMAN: It is the authorized dividend.

The Wandsworth representative agreed, but said the Company never intended to pay it.

The CHAIRMAN: That does not matter.

Mr. MILNE-WATSON (Governor of the Gas Light & Coke Company), said that as his Company had been mentioned, he would like to say that the extra charge for prepayment installations in his area was only 2d. and not 3⅜d.

On behalf of the South Metropolitan Gas Company, it was mentioned that the extra charge in that case was 1⅜d.; and on behalf of the Commercial Gas Company, it was stated that the extra charge was 2d.

Mr. BURGESS: Apparently we have a peculiar grievance in Wandsworth.

Brigadier-General F. G. STONE (of No. 49, Rutland Gate, S.W.) complained of an increase in his gas bills, and gave comparative accounts for the years 1920 and 1922. He said he was using gas for lighting and cooking. The four quarterly accounts in 1920 were: January, £4 11s. 10d.; April, £4 18s. 2d.; July, £4 15s. 11d.; and October, £5 7s. 6d. For 1922, the corresponding figures were January, £7 13s. 10d.; April, £6 4s. 6d.; July, £7 13s. 6d.; and October, £4 14s. 6d. There was thus an increase of 33 p.ct. since the therm system came into force. He had not given the 1921 figures, as his house was shut for four months.

Mr. F. W. GOODENOUGH (of the Gas Light & Coke Company) gave the following figures of consumption in this case: 1920, March quarter, 23,800 c.ft.; June, 23,000 c.ft.; September, 23,600 c.ft.; December, 24,800 c.ft. For 1922, the figures were: March quarter, 23,800 c.ft.; June, 29,400 c.ft.; September, 20,200 c.ft.; December, 25,200 c.ft. The total in 1922, therefore, was 98,600 c.ft., and in 1920, to December 6, 94,200 c.ft.

The CHAIRMAN (to witness): It is the price that is high. We are all complaining about that.

WITNESS: Since the introduction of the therm.

The CHAIRMAN: It so happens; but you have used the same amount of gas.

Mr. ALFRED MORRELL (of No. 3, Quarry Road, Wandsworth) said he was a customer of the Wandsworth Gas Company. He had a house of a rateable value of £28, and used gas for lighting and one cooking stove. There were seven in the family, and his bills for 1919, 1920, and 1921 were £12 15s., £14, and £17 respectively. He said he considered the price of gas was too high.

The CHAIRMAN: We all agree about that.

The yearly consumptions in this case were handed in by the representative of the Wandsworth Company—viz., 1919-20, 64,300 c.ft.; 1920 21, 60,700 c.ft.; 1921-22, 60,100 c.ft.

The CHAIRMAN said the consumption was absolutely consistent. They had all learned by this time that the higher bills had nothing to do with the therm, but simply that the price was increased at the time the therm was introduced.

WITNESS said he was told that although the calorific value of the Wandsworth gas was now 470 B.Th.U., as against 535 previously, it did not take any longer to cook or boil.

The CHAIRMAN: If it takes no longer you are getting it cheaper. [Laughter.] He added that the question of the length of time to do a particular operation was at the root of the matter, because the Committee were not yet satisfied that the public were getting the full advantage from the richer gas.

At this point, specimen account forms were handed in by the Wandsworth Gas Company. The CHAIRMAN remarked that these followed closely the Bristol forms. They had been in use during the past six months.

THE LONDON COUNTY COUNCIL'S VIEW.

Mr. JAMES OLLIS (Chief Officer of the Public Control Department, London County Council, which deals with the exercise of the Council's powers relating to gas supply in the County of London) was the last witness for the day. Questions were asked at the last sitting of the Committee as to gas examiners and gas testing; and witness dealt with these. The testing of gas by gas examiners appointed under Gas Statutes had been continuous in London for about 54 years. The gas examiners in London were appointed by the London County Council, who succeeded to power previously held by the Metropolitan Board of Works. Until the passing of the Gas Regulation Act, 1920, this

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examination was limited to the gas supplied by the three large Metropolitan Gas Companies. It now covered gas supplied to the Metropolis by three other Gas Companies who supplied parts of London; the larger parts of their areas of supply, however, being in Middlesex, Surrey, and Kent. In these cases, the examiner was the joint nominee of the Council and the other interested local authorities. The testing-places and testing apparatus were provided and maintained by the Gas Companies to a prescription made by the Gas Referees. The method of testing was specified by the Gas Referees in their "Notifications," copies of which had probably been supplied to the Committee. The several tests determined the heating power, purity, and pressure of the gas as supplied to the consumer, and were carried out at eighteen testing-places in the county of London, situated at positions determined by the Gas Referees so as to afford a reasonable probability that the gas should be adequately tested. The reports of the gas examiners were sent to the Council, the Gas Referees, and the Gas Companies concerned. The form of the report used by the examiner in reporting the results of his testings was set out in the "Notification" of the Gas Referees. The Statute required that the gas examiners should be competent and impartial persons; and in order to give full effect to this requirement, the examiners appointed by the Council were part-time officers, practically all of whom were qualified in chemistry or had other qualifications. Several of them were fellows of the Institute of Chemistry. Before their appointment they were carefully examined by an officer of the Council in order that the Council might be satisfied as to their qualifications for the work. In addition to the gas examiners, a fully-qualified officer from time to time visited the testing-places to examine the records of the examiners and assure the Council that the work was proceeding satisfactorily. The examiners' reports were duly recorded and summarized for the information of all parties concerned. Witness submitted for the information of the Committee a summary of the testings in the form of a quarterly report as presented to the Committee of the Council dealing with this subject, and also copies of the examiners' daily reports.

It was added here that tests were still taken of illuminating power; and witness handed-in a large sheet of results of tests upon which such tests were shown.

The CHAIRMAN, after examining the sheet, said it appeared that there was no gas in London to-day which would supply a flat-flame burner satisfactorily.

Mr. OLLIS said he would not say that. The tests that had been made in the case of the Gas Light and Coke Company, for instance, did not enable the gas examiner to give the gas a positive value from the point of view of illuminating power. He would not like to express an opinion whether the figure of 10·46 c.p. in the case of the South Metropolitan Company would give a good illuminating value for a flat-flame burner.

Answering the CHAIRMAN further as to the object of having these illuminating power tests, witness said the Legislature apparently thought the flat-flame burner should not be entirely ignored. These tests were provided for in the London Gas Act, which was the only Statute that had not been repealed by the Act of 1920. He did not think the illuminating power test held outside London.

Figures were then quoted from the large sheet that had been handed-in showing that the London Companies had been supplying a gas, on the average, slightly higher than the standard.

The CHAIRMAN: So far as that goes, the public get the advantage without cost?

Mr. OLLIS said he would hardly go so far as to say that. The fixing of a standard was a complex matter. He believed the standard price was fixed with the knowledge that the value of the gas would have to be a little above the standard if the company were not to get into trouble.

Continuing his main evidence, Mr. OLLIS said that, in addition to the staff regularly employed on this work, the Council had appointed a number of relief gas examiners who undertook testings on Sundays and on holidays, and on occasions when the regular examiners were for any reason unable to discharge testing duties.

WITNESS also submitted some observations as to the desirability of obtaining a gas of common quality from all the gas companies operating in the administrative county. Two leading principles on which the Gas Regulation Act, 1920, was based were: (1) That the consumer should be charged only for the potential thermal units supplied to him, and (2) that a gas undertaking should be free to fix the calorific value of their gas at that which was most economical for them to produce. The Council had endorsed both these principles; but the second with a qualification. The report of the Fuel Research Board of the Department of Scientific and Industrial Research drew attention to the fact that "the experience of the electrical industry in regard to lamps and voltages had shown that unlimited licence in this respect had resulted in the needless multiplication of lamps and fittings for odd voltages, which had to be made and stocked," and applied this argument to the question of the supply of gas. It urged the desirability of some action by representatives of consumers, producers, and the makers of fittings for a standardization of gas-burners, so that the maximum efficiency in the burning of gas might be obtained. This was a point on which the Council held a very strong view, having regard to the character and requirements of the London area; and they had submitted this view to the Fuel Research Board in the course of their inquiry, and subsequently to the Board of Trade on the publication of the report of the Fuel Research Board. The Council were of opinion that throughout the area of Greater London there was a very close approximation to uniformity in the requirements of consumers; that this should be associated with uniformity in the processes of gas manufacture; and that it should be possible for London Gas Companies to adjust their methods so as to produce a gas of common quality. With uniformity in the calorific value of gas, manufacturers supplying gas-burning appliances to the London area could adjust such appliances so as to burn that gas to the best advantage. There were in the area of Greater London about 24 companies supplying gas with a calorific value ranging between 560 and 450 B.Th.U. per cubic foot, as would be seen from the following:

TABLE *showing Calorific Values declared by Gas Companies in and around London.*

Company.	Declared Calorific Value. B.Th.U. per Cubic Foot.
The Gas Light and Coke Company	Original declaration 475, but raised to 500 on June 15, 1922
South Metropolitan Gas Company	Original declaration 550, but raised to 560 on June 17, 1922
Commercial Gas Company	475
South Suburban Gas Company	460
Wandsworth, Wimbledon, and Epsom District Gas Company	470
Brentford Gas Company	460
Barnet District Gas and Water Company	475
Croydon Gas Company	470 (being raised to 500 on Jan. 1, 1923)
Elstree and Boreham Wood Gas Company	460
Hampton Court Gas Company	450
Harrow and Stanmore Gas Company	450
Hornsey Gas Company	470
Kingston-upon-Thames Gas Company	470
Lea Bridge District Gas Company	450
North Middlesex Gas Company	450
Pinner Gas Company	500
Richmond Gas Company	460
Southgate and District Gas Company	450
Sutton Gas Company	460
Tottenham Light, Heat, and Power Company	Original declaration 450, raised to 500 on June 30, 1922
Uxbridge and Hillingdon Gas Company	460
Waltham Abbey and Cheshunt Gas and Coke Company	450
Walton-on-Thames and Weybridge Gas Company	450
Watford Gas and Coke Company	475

The number of makers supplying gas-consuming appliances to the London area was very considerable; but they could have little or no knowledge as to the districts in which the appliances would be used, and, consequently, little or no opportunity for adjusting the appliances so as to produce the maximum efficiency in the consumption of the gas. The majority of the declared calorific values in the areas of the Companies set out in the table were comparable with the low-power gas supplied during the war period, of which much complaint was made. It was submitted that the London Gas Companies would find no real difficulty in adopting the practice recommended by the Council. For some years preceding 1921, the three large London Gas Companies were required to supply gas of an illuminating power of 16 candles, which had a calorific value of about 615 B.Th.U. per cubic foot. They had no real difficulty in maintaining a supply of gas of this quality. Although they were meeting the requirements of a population of about four million people, they very rarely defaulted in maintaining their gas at the requisite quality. On some of those rare occasions of default, the default was found to be due to causes beyond the control of the Companies, who were exonerated from blame. This standard of 16 candles was, however, maintained by processes of enrichment. On account of changes in the methods of burning gas for illuminating purposes, and for economical reasons, the standard was reduced, at different dates for the different Companies, to one of 14 candles. According to conclusions drawn from the tests of the Council's gas examiners, made over a considerable period, this standard 14-candle gas had a calorific value of about 540 B.Th.U. This drop from a 615 B.Th.U. gas to a 540 B.Th.U. gas was effected without any physical alteration in the plant for producing coal gas. The standard of illuminating power in many instances was abandoned before the war period, and was now entirely replaced by the standard of calorific value. At one time or another before the war, all the Companies set out in the table were required by their statutes to supply gas either of a calorific value of 540 B.Th.U. gross, or of an illuminating power the calorific equivalent of which was about 540 B.Th.U. gross. From the point of view of the consumer, no good purpose could have been served by a departure from a standard which was common throughout the whole Metropolitan area. Some London Gas Companies appeared to be realizing this, and had already made increases in the declared calorific value of their gas since the granting of the original Order made under the terms of the Gas Regulation Act, 1920. There was reason for the view that in the course of time other companies would find it to their advantage to supply gas of a higher power than their present declared calorific value. But such a succession of changes in a short period could hardly be to the advantage of the consumer. It would require a large measure of faith to entertain and retain the view that consumers' appliances had been adjusted to meet the variations in calorific value that had arisen between the years 1913 and 1922.

The calorific value of gas as supplied to the consumer was not, of course, a constant quantity. The extent of the variation between daily testings of the gas of the three large London Gas Companies during the quarter ended Sept. 30, 1922, was indicated in the following table:

Showing the Results of Testings made by the London County Council during the Quarter ended Sept. 30, 1922.

Company.	Declared Calorific Value.	No. of Testings Made.	Maximum Test.	Minimum Test.	Average of all Testings.
	B.Th.U.		B.Th.U.	B.Th.U.	B.Th.U.
The Gas Light and Coke Company	500	871	532·1	483·3	501·1
South Metropolitan Gas Company	560	549	587·2	548·4	565·0
Commercial Gas Company	475	276	549·1	470·4	492·0

The above table showed that in the area of these three Companies the quality of the gas supplied during the past quarter had varied

between such wide limits as 587·2 and 470·4 B.Th.U., while the minimum value of a 450 B.Th.U. gas would be still lower. Nevertheless, the same type of gas-burning appliance was sold to consumers for use under such widely different conditions. If over the whole of Greater London there were one local authority for dealing with gas matters, there could be no doubt that the views of such an authority would be in agreement with the views of the Council. The establishment of such an authority was a matter for speculation, but there could be no doubt that the requirements of the inhabitants of this area were of a common nature. For instance, the London County Council were very large consumers of gas in London, and also at institutions beyond the county boundary. The Council were of opinion that it would be an easy matter for all gas companies in this large and homogeneous area to supply gas of a uniform quality, so as to meet public requirements to the best advantage. In districts with different industrial conditions, a different calorific value might be desirable; but in the opinion of the Council the liberty to gas companies to fix their own calorific value should in London be governed by geographical considerations and the common requirements of London gas consumers. He would like to put this point in another way. The Gas Light and Coke Company supplied gas over a very large area. In recent years their area had increased, and it might still further increase. It extended from the banks of the Thames to Willesden and Kingsbury in the north-west, and to Loughton and Romford in the north-east and east. The Company also supplied a small area south of the Thames. Supposing, for Company reasons, it were desirable to dissolve the Company and form a number of smaller companies. Would it be reasonable to allow each of those companies to adopt a different calorific standard, when each might easily adopt a common standard? The illustration of the Gas Light and Coke Company was interesting in another way. Their boundaries were very largely flanked by Companies who supplied gas of the war-period standard.

On the question of whether fittings had been adjusted in the London area since the 1920 Act, Mr. Ollis had no knowledge, except that he was aware of one or two cases in which it was not done. When the calorific value dropped from 550 to below 500 B.Th.U., and the same fittings were used, there must be a loss of efficiency. At the same time, he had not the slightest doubt that if any customer asked the gas companies to adjust his fittings, it would be done at once. Whether the customers voluntarily asked the companies to do it, however, was another matter.

The CHAIRMAN raised the question whether, if the gas companies had a free hand as to the gas they made, they might not get a better return from their residuals, and so benefit the gas consumer by being able to reduce the price of gas.

Mr. OLLIS said he could not say whether, for instance, the South Metropolitan Company obtained a better return from their residuals on account of the different gas they supplied.

The CHAIRMAN: Then to what do you attribute the fact that the London Companies have declared different calorific values?

Mr. OLLIS said that for years the South Metropolitan Company had supplied a straight coal gas, whereas the Gas Light and Coke Company and the Commercial Company had used part of their coke for making water gas, and then mixed the water gas with the richer coal gas. This gave quite a good gas, but with a lower calorific value.

The CHAIRMAN said the Committee were very anxious to appreciate whether the consumer obtained more benefit from a lower calorific value gas compared with a higher one—whether, for instance, in the long run a 475 B.Th.U. gas might not be more economical than a 550 B.Th.U. gas.

Mr. OLLIS replied that he would not care to venture an opinion upon that. The view of the Council was that as the three Companies had been able to supply a 16 c.p. gas for years, it should be possible for a uniform value of gas to be supplied on the calorific value basis, although the London County Council did not attempt to say which was the best value to adopt. The Gas Light and Coke Company had slightly raised their value, and there was something about that which seemed to be some justification for expecting even a higher figure than that now adopted.

On the question of pressure, Mr. Ollis granted that it was impossible for the gas companies to regulate the pressure to meet the requirements of every individual consumer. The consumer must do all he reasonably could to adjust the pressure himself at his own fittings. As to the inspection of consumers' apparatus, there were no powers on the part of the London County Council to do this; and although no doubt the question of getting powers had been considered—as every phase of the gas question had been considered from time to time—no such suggestion had ever been put forward. It would involve the appointment of an army of officers, added witness, and, from the point of view of economy, it would not be a desirable thing to do. There would be the less need for it if the supply was a standard one, so that manufacturers of fittings could then put a standard fitting on the market to suit the London gas.

The CHAIRMAN suggested that London was so big that it could very well stand two or three different calorific values.

Mr. OLLIS, however, would not depart from the view he had expressed.

Asked by Sir JAMES MARTIN as to why he thought the South Metropolitan Company supplied a richer gas, Mr. Ollis said he rather took the view that it was the result of a tradition, in that the Company had always supplied a straight coal gas.

Mr. MARTIN pointed out that Prof. Boys in his evidence had said that the requirements of London were not of a common nature, whereas Mr. Ollis had said they were, inasmuch as he was asking for a standard gas.

Mr. OLLIS said he had taken Prof. Boys to be referring to the whole of the country, and not to London. Anyway, he himself was only concerned with London; and he adhered to the view he had given. Undoubtedly there might be places in England where it would be economical to produce a gas of a different quality; but in London the Council's point was that it would be commercially economical and possible for all the Companies to tune their plants so as to produce a gas of a common quality—whether 500 or 550 B.Th.U., or any other figure, he was not prepared to say. He was the more confirmed in this opinion because he foresaw a time when more companies in the London and surrounding district would be in the one hand.

Mr. PUGH put a few questions on testing, and asked if it might not be thought that gas examiners appointed by the London County Council could be accused of a little bias on behalf of the consumer.

Mr. OLLIS said he believed it would be accepted by everyone that the gas examiners were absolutely impartial. The cost of each London testing-station was £360 per annum; and he thought the present number was sufficient.

The question of the one standard gas was again dealt with by Mr. Pugh, who put it that differences in manufacturing processes might make one standard difficult. Mr. Ollis, however, would not accept this view. When the character of the gas supplied by the South Metropolitan Company was departed from, then the question of inerts came in; and if the inerts were reduced to a reasonably low figure by the other companies, then a better value gas was obtained. When the London Companies were making 16-c.p. gas, they worked to a 5 p.ct. margin of inerts. He had recently had to analyze the gas of the Gas Light and Coke Company, which had a declared value of 500 B.Th.U., and the percentage of inerts was 16·2 p.ct. As a matter of fact, that was lower than the figure in 1913, when it was 17·3, although the calorific value was higher then than in 1922. He emphasized the point that the South Metropolitan Gas Company are now supplying the same quality gas that they did before the war.

Mr. WOOLCOCK put some questions suggesting that sufficient publicity had not been given by the London County Council to inform the public as to the nature of the change from the illuminating power value to the calorific power value.

The reply was that it was not the function of the Council to do this. Mr. Ollis added, however, that there had been a tremendous amount of publicity from one direction and another, and he should imagine that the public were more familiar with what it meant in 1920 than they were to-day. He sometimes thought that if the gas companies had pointed out to the consumers that they should multiply the number of cubic feet by the calorific value declared, they would have better been able to understand.

Several questions were then put on the suggestion that the consumer, when he was supplied with a gas which on the average was higher than the declared value, was getting something which he did not pay for. Mr. Ollis, however, would not agree. Further, he would not have it that there was anything in the manufacturing processes of the London Companies which would militate against the adoption of a standard gas. His point upon this, and also in regard to the return from residuals, was that if all the London Companies were absorbed into one—and the process was going on all round—there would be no difficulty in having a standard gas. Therefore, it should be possible now.

Mr. WOOLCOCK: Then why in the past, long before committees of this kind were thought of, did the Gas Light and Coke Company, the Commercial Company, and the South Metropolitan Company, in building up their businesses, do it on a different basis. There must be some reason.

Mr. OLLIS replied that the Companies were doing it on a common basis before 1914, when gas was supplied on a candle power basis, and there was a close approximation between candle power and calorific power.

Mr. WOOLCOCK: So you are telling us that the gas supplied by these Companies in years gone by was identical gas.

Mr. OLLIS: Within close limits.

Mr. WOOLCOCK then put some questions with regard to the table of calorific values put-in by witness, and suggested that, leaving out the South Metropolitan Company, the difference between the highest and the lowest was 50 B.Th.U. The difference between the maximum and minimum B.Th.U. supplied by the Gas Light and Coke Company, as shown by witness's second table, was 48·8 B.Th.U.—practically the same. The point was that, in regard to the need for a standard gas, the average variation in practice was no worse than the differences between the declared values; and as the consumer's fittings had to cope with that variation in any case, the need for a standard gas was not so important as the Council had suggested.

Mr. OLLIS, in the first place, however, would not agree to leave out the South Metropolitan figures, and, secondly, was not prepared to take even the figures in the tables for the purposes of the argument put forward by Mr. Woolcock. He said he would prefer to take the maximum actually supplied by the highest company and the minimum supplied by the lowest for the purpose of seeing the range within which the fittings would have to work. The variation referred to by Mr. Woolcock was the average during a whole quarter; but the variation on occasions might be much more, and it had to be borne in mind that the manufacturers supplied the same fittings for the whole of London. He agreed that even if there was a standard declared value and standard fittings, there would still be the variation indicated by the Gas Light and Coke figures mentioned, and which he agreed was unavoidable.

Mr. WOOLCOCK: That is my point.

VIEWS OF THE CITY CORPORATION.

The CHAIRMAN then announced that no more evidence would be taken that day; but he added that the following letter had been received by the Secretary from Sir James Bell, Clerk to the City of London Corporation:

> "The Corporation have had under consideration the question of the proceedings at the Departmental Committee now sitting as to the calculation by therms for gas, and I am directed to ask you to be good enough to inform the Committee that, although not desiring to offer evidence at the inquiry, the Corporation are of opinion that it would be a satisfaction to consumers if the gas companies were to render accounts which show the consumption in cubic feet as well as therms, together with the charges worked-out for each system, as is now done in Bristol."

The next sitting will be held on Tuesday, Jan. 9, when the National Gas Council will be heard; and Tuesday, Jan. 16, has been provisionally fixed for another sitting, in case it should be found necessary.

XUM

A COMPREHENSIVE FORM OF ACCOUNT.

What the Bristol Gas Company Are Doing.

It will have been noticed from the report of the proceedings appearing in last week's "JOURNAL," that at the first sitting of the Therm Inquiry Committee, Prof. C. V. Boys, while giving evidence on behalf of the Gas Referees, handed to the Committee a form of account to be rendered by the Bristol Gas Company to their consumers, for the December quarter, 1922, which, he pointed out, set out clearly the gas used, both in volume and in therms, and gave other information which enabled the consumer to make comparisons. There were also instructions on the back as to what a therm was, how the conversion was calculated, and how to read a gas-meter. The Chairman said it seemed to be a very comprehensive and satisfactory document.

We reproduce below the essential portion of the front of the account, as well as part of the information given on the back.

THE BRISTOL GAS COMPANY.

December Quarter, 1922.

1922.		£	s.	d.
Dec. 30.	For Gas supplied during the Quarter—			
	Index of Meter, Dec.			
	Ditto. Sept.			
	Gas consumed in Cubic Feet 00			
	Equal to ____ Therms at 8½d. per Th. (3s. 4·8d. per 1000 c.ft.)			
	Hire of Meter			
	Hire of Cooker			

"THERMS."

A "THERM"	A BRITISH THERMAL UNIT (B.Th.U.)	DECLARED VALUE of BRISTOL GAS.
Is 100,000 British Thermal Units.	is the amount of heat required to raise the temperature of one pound (nearly one pint) of water one degree Fahr.	The Company will, until further notice, supply Gas of a Declared Calorific Value of 480 B.Th.U. per C.Ft.

HOW THE CONVERSION IS CALCULATED.

Multiply the number of Cubic Feet consumed by 480 B.Th.U. (Declared Calorific Value) and divide by 100,000 (B.Th.U. in One Therm).

For Example:

$$\frac{1000 \text{ Cubic Feet} \times 480 \text{ B.Th.U.}}{100{,}000 \text{ (B.Th.U.)}} = 4{\cdot}8 \text{ Therms.}$$

Commenting on the matter, the "Bristol Times" says: Congratulations are due to the Bristol Gas Company on the high compliment which has been paid to them by the Committee. Prof. C. V. Boys handed in the Bristol Gas Company's form of account; and the Chairman of the Committee (Sir Clarendon Hyde) and the witness were agreed that this form of account was valuable as showing the consumer exactly what he was paying for. Since then the Secretary of the Committee has written to the Bristol Gas Company for additional copies of their form of account for the use of the Committee, who, he said, were favourably impressed by the copy which Prof. Boys had handed in. When this form of account was first circulated in Bristol, we commented on its excellence, and also on the usefulness of an attached slip containing other information for the consumer, who in ninety-nine cases out of a hundred has no knowledge of the meaning of the therm or of the reasons why the Board of Trade have imposed that method of reckoning upon the gas companies. As a fact, it is done in the interests of the consumer, and ensures that he gets the heat he pays for and that it will be consistently maintained.

The Evolution of Gas.

Many interesting historical details were given by Mr. W. S. Morland, the Engineer and Manager of the Gloucester Gas Light Company, in the course of a luncheon lecture at the local Rotary Club, on "Gas." He said that, previous to the commencement of the seventeenth century, only the most vague conjectures existed respecting any aeriform body differing from atmospheric air; and it was probable that these were suggested by the mysterious and sudden deaths which occurred in subterranean or other enclosed places by the accumulation of carbonic acid gas. But as at that period no substantial reason could be given for such direful calamities, superstition supplied the want and attributed them to the work of evil spirits who tempted men into those fatal localities, and there treacherously deprived them of life. By alchemists this was called the "Spirit Sylvester," or wicked spirit. At the period referred to lived the celebrated Van Helmont, of Brussels, among the last of the alchemists and one of the earliest and most important contributors to modern chemistry. Van Helmont was the first to understand that there existed other aeriform bodies differing from ordinary air. To these he at first applied the usual term "spirit," and in reference to them remarked: "This spirit, up to the present unknown, not susceptible of being enclosed in vessels, not being capable of being reduced to a visible body, I call by the name 'gas.'" Tracing from this point the evolution of gas and its progress down to the present time, Mr. Morland concluded his lecture (for which he was heartily thanked) by referring to what the industry did to help the Ministry of Munitions during the war.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" regarding applications to the Board of Trade for Orders under the Gas Regulation Act.

DECLARATIONS OF CALORIFIC POWER.

Hartlepool Gas and Water Company.—510 B.Th.U. (March 9, 1923.)

Radcliffe and Little Lever Joint Gas Board.—480 B.Th.U. (March 15, 1923.)

Staveley Gas Light and Coke Company, Ltd.—480 B.Th.U. (March 16, 1923.)

Sutton Gas Company.—480 B.Th.U., in substitution for 460 B.Th.U. (April 1, 1923.)

SPECIAL ORDER.

South Suburban Gas Company.

The Company notify their intention to apply to the Board of Trade for a Special Order under section 10 of the Act, to authorize them to purchase, hold, and deal with lands, and to make new provisions with regard to valves and appliances to be used where high-pressure air is employed.

FIRE AT THE PROVAN GAS-WORKS.

Small Amount of Damage Done.

On Monday evening, the 18th inst., at about 11 o'clock, an accident occurred at the Provan Gas-Works, Glasgow, which was primarily due to the bursting of the 6 in. steam connection between the main steam-pipe and the exhausters. Through the stoppage of the exhauster, gas could not be drawn from the benches, with the result that the back-pressure rose and blew two of the seals on No. 5 bench of the vertical retort installation, where the gas ignited. The bench was immediately isolated.

The fire was extinguished within three hours of the outbreak, and the whole plant was in full operation on Wednesday morning, the 20th inst. The damage is estimated at about £300.

LONDON COUNTY COUNCIL AND THE THERM INQUIRY.

Some interesting remarks regarding the action of the Public Control Committee in connection with the therm inquiry were made at last week's meeting of the London County Council.

Mr. DAVID DAVIS (North Kensington) asked the Chairman of the Public Control Committee whether the Departmental Committee now sitting appeared to be taking evidence on the question of standard prices and other matters outside the scope of the Council's resolution of October last; and, if so, would the Council's officers be instructed forthwith to prepare and give evidence before the Committee regarding the present standard prices of the Metropolitan Gas Companies and the increased dividends consequential thereon.

Mr. CYRIL JACOBS (Vice-Chairman of the Committee) replied that the Departmental Committee had admitted certain evidence on the question of standard prices. The Comptroller had given evidence the previous day [Monday] which covered the necessity of revising the standard prices.

On the report of the Public Control Committee coming up for consideration,

Mr. W. C. JOHNSON (Whitechapel and St. George's) moved the adjournment of the Council. The Public Control Committee, he said, though they recommended the Council on Oct. 17 to ask the Board of Trade for an immediate inquiry into the method of charging for gas by the therm, had consistently refused, even since the appointment of the Departmental Committee, to give the Council any indication as to the policy which should be pursued or the evidence that should be put forward. From the evidence given before the Departmental Committee the previous day [Monday], the ground had been cut from under the feet of the Council. According to reports in the Press, the Parliamentary Officer stated that the Council raised no objection to the use of the therm as such; while the Comptroller said that there was no reason to attribute the increase in the amount of gas bills to the change in the basis of charge. The Council had been misled and placed in an undignified position by the Committee, who had acted merely in response to a newspaper outcry, for which they knew there was little justification, and had thus caused public money to be expended needlessly on the Departmental Committee.

The Rev. Dr. SCOTT LIDGETT seconded the motion.

Mr. CYRIL JACOBS, in reply, remarked that at a special meeting of the Public Control Committee the previous Friday, it was unanimously agreed that it was not in the public interest to issue a report before that of the Departmental Committee. Such report would have to allude to the actual evidence to be given by the Council's officers at the inquiry. His Committee had recommended the Council to urge an inquiry, not only because of Press agitation, but because the Council themselves had received thousands of letters from different channels complaining of gas charges.

The motion to adjourn was defeated, only ten voting in favour of it.

Darlington Corporation Accounts.—The accounts and statistics of the County Borough of Darlington Gas-Works, a copy of which has been received from Mr. A. E. Ruffhead (the Engineer and Manager), show that the gross income for the year ended March 31 was £144,057, and the net profit £4983, of which £2000 has been transferred in aid of the general district rate, and £2983 carried to reserve fund. The quantity of coal carbonized was 38,011 tons, and of gas made 572,648,000 c.ft., or 15,065 c.ft. per ton carbonized. The unaccounted-for gas was 4·45 p.ct. of the make. The ordinary consumers numbered 7604, and prepayment meter users 8054. The mileage of mains was 82.

TORONTO CONSUMERS' GAS COMPANY.

The Annual General Meeting of the Company was held in Toronto on Nov. 13—Mr. A. W. AUSTIN (the President) in the chair.

The Directors reported that during the year ended Sept. 30 there had been an increase of 4586 in the number of consumers. The net earnings for the year were $1,478,274. The coal miners' strike in the United States caused the Directors much anxiety in the securing of an adequate supply of gas coal. It was satisfactory to be able to report that, notwithstanding the long duration of the strike, the Company were able to maintain a full supply of gas throughout the period. This was not accomplished, however, without adding greatly to the Company's operating expenses, due in part to the necessity of purchasing and transporting a large quantity of English gas coal, and to the fact that American gas coal could not be purchased except at greatly enhanced prices, and with uncertain deliveries.

As a result of the general shortage of coal, and the difficulties experienced by citizens in obtaining sufficient coal for the heating of their houses, the demand for gas during the month of September exceeded that for any month during the Company's history. The average daily output of gas for that month was 15,527,000 c.ft., as compared with the highest previous average daily record, in January, 1920, of 15,162,030 c.ft. On Sept. 25 the Company recorded their maximum daily output of gas, which amounted to 18,662,000 c.ft., being an increase of 1,258,000 c.ft. over the previous maximum day. The demand for gas continued to tax the Company's manufacturing capacity to its limit; and while the revenue from the sale of gas showed a decrease, compared with the previous year, of $418,452, this amount really represented the saving to the consumers generally from the application of the schedules of rates for gas which were made effective on Feb. 15 and June 15. The present schedule is:

First	10,000 c.ft. per month,	9c.	net per 100 c.ft.
Next	90,000 c.ft. ,,	8½c.	,, ,,
Over	100,000 c.ft. ,,	8c.	,, ,,

Service charge—50c. per meter per month.

As compared with the flat rate of $1.25 per 1000 c.ft. (the rate charged for gas prior to Feb. 15), the above schedule represents an annual saving to the consumers of nearly $1,000,000.

Application had been made for supplementary letters patent, which were granted on Dec. 9, 1921, increasing the authorized capital stock of the Company from $6,000,000 to $12,000,000.

The following statement for the past, as compared with the preceding, year shows:

	Meters.		Gas Sales.
Year ended Sept. 30, 1922	132,141	..	$5,408,829
Year ended Sept. 30, 1921	127,555	..	$5,827,282
Increase	4,586	..	—
Decrease	—	..	$ 418,452

The CHAIRMAN said that, owing to the strike above referred to, the Company imported some 28,000 tons of gas coal from Durham. In some respects they did not find the coal equal to that from the United States; but this first experience of importation from England might be of very great advantage to the Company in the future. More than 75 p.ct. of the gas they supplied was used for other than lighting purposes. Not much further time should be lost in preparing for works extensions.

Mr. ARTHUR HEWITT (the General Manager) said that, so far as the management of the Company was concerned, the conditions had been far more worrying and far more perplexing since the close of the war than they had been during the war period itself. The outstanding feature of the year's statement was that it marked the turning point from a period of increasing costs to one of lower costs to the consumer.

The report was adopted unanimously.

TRADE NOTE.

"F.A." Stoking Machines.

The Plymouth Corporation, for their gas-works at Devonport, have given Messrs. Aldridge & Ranken, Ltd., an order for a second "F.A." machine. The first machine, built in 1913, is still working satisfactorily.

Tully Gas Plants.

Tully Gas Plants, Ltd., have just completed an installation of 2 million c.ft. per day for the Kobe Gas Company, Japan, fitted with carburettors and waste-heat boilers, and all their latest improvements. They have learned by cable that the plant is satisfactory, and the waste-heat boiler a great success. The Newark Gas Company have placed an order with the firm for the addition of oil carburettors to their Tully gas plants, similar to the plant at Belper.

Workmen's Cottages at Hemel Hempstead.

The Housing Architect to the Hemel Hempstead Rural District Council, referring to a contract carried out by the Nautilus Fire Company, Ltd., of No. 60, Oxford Street, W., for the building of workmen's cottages in their area, has expressly thanked the Company for the courtesy and consideration shown by them in their business relations with the Council. There was not the slightest hitch in the carrying out of the work, which amounted approximately to £37,000; and the Architect is perfectly satisfied with its good quality.

Reduction at Kidderminster.—The Kidderminster Gas Company have decided to reduce the price of gas, from the readings of the meters for the December quarter, by ¾d. per therm, or 3d. per 1000 c.ft. This will make the charge 5s. 3d. per 1000 c.ft.

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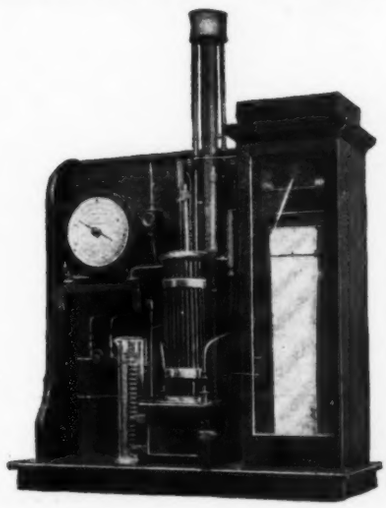

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CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Dec.* 21.

Pitch is showing a harder tendency once more, buyers now having to cover their requirements for delivery during the next few months. The price is firm at about 125s. per ton, net f.o.b. makers' works. Creosote is in good demand, and the price is steady at about 8½d. per gallon in bulk at makers' works. Pyridine bases has developed a much firmer tendency of late, and prices in the neighbourhood of 8s. 6d. per gallon are obtainable; but supplies are short. Pure benzole and pure toluole are about 2s. 4½d. to 2s. 6d per gallon. Solvent naphtha, 95 160, is about 2s. per gallon. Crystal carbolic acid is quietly firm at from 8d. to 8½d. per lb. Other products are without change.

Tar Products in the Provinces.

Dec. 22.

The average values for gas-works products during last week were: Gas-works coal tar, 69s. 6d. to 74s. 6d. Pitch, East Coast, 117s. 6d. to 122s. 6d. f.o.b. West Coast—Manchester, 112s. 6d. to 117s. 6d.; Liverpool, 113s. to 118s.; Clyde, 115s. to 120s. Benzole 90 p.ct. North, 1s. 8d. to 1s. 9d.; crude 65 p.ct. at 120° C., 1s. 0½d. to 1s. 1d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 8d. to 1s. 9d. Toluole, naked, North, 2s. to 2s. 1d. nominal. Coal tar crude naphtha in bulk, North, 8½d. to 9½d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 10d. Heavy naphtha, North, 1s. 10d. to 1s. 11d. Creosote, in bulk, North, liquid, 6¼d. to 6⅝d.; salty, 6¼d. to 6½d. Scotland, 5½d. Heavy oils, in bulk, North, 6⅜d. to 7¼d. Carbolic acid, 60 p.ct., 2s. 4d. to 2s. 7d. Naphthalene, £15 to £16; salts, £5 10s. to £6 10s., bags included. Anthracene, "A" quality, 5d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

Manchester District Tar Prices.

The average price realized for the sale of tar in the Manchester district, according to the sliding-scale, for the month of November was £4 6s. 9·63d. per ton.

Price Reductions in Scotland.—The Vale of Leven Gas Light Company are reducing the price of gas by 5d. The rates are now 4s. 2d. per 1000 c.ft. for ordinary consumers, and 4s. for commercial users. At North Berwick the price has been lowered by 2½d. to 5s. 10d. per 1000 c.ft.

Gas Fivepence Halfpenny per Therm at Bath.—Both the users of gas and Mr. J. Wesley Whimster (the Engineer and Manager) are to be congratulated upon the fact that the Directors of the Bath Gas Light and Coke Company have decided to make a further reduction in the price of gas, from the readings of the meters for the December quarter, of ½d. per therm. This will bring the price of gas to ordinary consumers to 5½d. per therm.

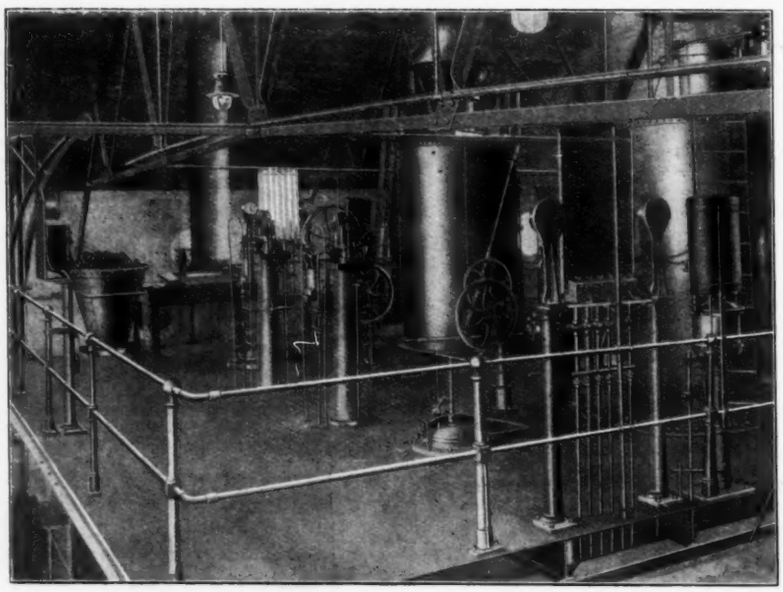
Blyth Gas Company's Reduction.—A reduction in the price of gas is announced by the Blyth Gas Company, commencing with the readings of the meters during the present month. In the Blyth area the price will be reduced from 10·66d. to 10d. per therm, equal to 3s. 9d. per 1000 c.ft. In the Bedlington area the reduction will be from 1s. to 11·33d. per therm, equal to 4s. 3d. per 1000 c.ft. The reduction represents 3d. per 1000 c.ft. under the old method of charging.

Belfast Gas Engineers.—Belfast Corporation gas engineers are included in a resolution adopted by a joint meeting of the Improvement, Gas, Electricity, and Tramways Committees recommending the Council to restore, as from Jan. 1, the 5s. 6d. per week by which wages of gas engineers were reduced on Sept. 25. The dispute that had arisen threatened dislocation of the Corporation utility services, and this amicable settlement has been welcomed by all concerned.

South Barracas (Buenos Ayres) Gas Company.—At the meeting next Friday, the Directors will report that, owing to delay in Buenos Ayres, they are only able to submit audited accounts for the six months to Dec. 31, 1921. For this period, the debit balance of revenue account, after charging interest, is £6826, making, with the debit balance brought from last account, a total debit balance at Dec. 31, 1921, of £152,231. The Primitiva Gas Company of Buenos Ayres have continued to supply gas at cost price. While no definite agreement has been made with them, negotiations are still proceeding.

The Lights of London.—An illustrated lecture entitled "The Lights of London, Old and New," was delivered on the 16th inst., at the London County Council Scarsdale Road School, Peckham, by Mr. W. J. Liberty (Inspector of Public Lighting to the Corporation of the City of London) to the 47th Camberwell Troop of Scouts. In the course of his remarks, Mr. Liberty said in 1922 it was found that in the Metropolis alone, with about 500 miles of streets, there were no less than from 28,000 to 30,000 lamps (of gas and electricity) under the control of the Corporation of the City of London, the London County Council, and 28 Borough Councils. The Underground Railway Combine, who carry millions of passengers through their system, have no less than 160,000 electric lamps to turn darkness into day.

Bangor (co. Down) Gas Undertaking.—Mr. R. Fagan (the Chairman of the Gas Committee) announced at a meeting of the Bangor (co. Down) Urban Council that it had been decided to reduce the price of gas by 8d. per 1000 c.ft., from 4s. 2d. to 3s. 6d., which, with 5 p.ct. discount for payment within a month, brought the price down practically to the pre-war figure of 3s. 4d. Users of slot meters would also get the benefit of the 5 p.ct., and this consumption would therefore be reckoned at the rate of 3s. 4d. per 1000 c.ft. He attributed the remarkably low price at which they were able to sell gas to the efficiency of the Gas Manager (Mr. Barker Mitchell) and his staff. Mr. J. M. Thomson, J.P., said that their being able to get so close to the pre-war basis reflected the utmost credit on the management of an undertaking in which the ratepayers had a profitable and increasingly valuable property. The Council approved the recommendation.



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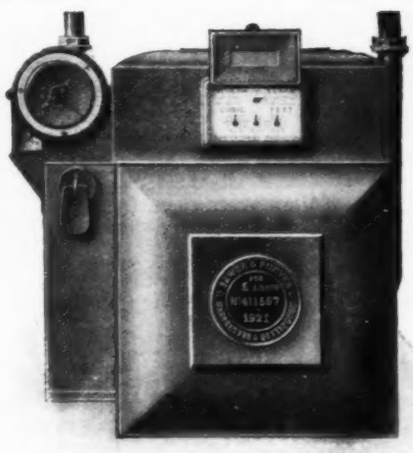

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APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Dec. 20.]

Nos. 33,710 to 34,405.

BEARD, G. F. H.—"Gas-diverting valve for gas-purifiers, &c." No. 34,095.

CATON, W. E.—"Lifting-gear of gas-retort stoking-machines." No 33 980.

COCKS, W. E.—"Gas or electric cooking-apparatus and grill." No. 34,247.

COMMIN, F. J.—"Discharging products of combustion from gas, &c , stoves." No. 34,306

COOMBS, H. A.—See Caton, W. E. No. 33 980.

COWEN, M.—"Gas-cooker." No. 34,375.

DAVIES, W. E.—Carbonization and/or gasification of fuels." No. 34,066.

DEMPSTER, LTD., R & J.—See Beard, G. F. H. No. 34,095.

EASTON, R. W.—"Grate bars for gas-producers." No. 33,891.

GAS LIGHT & COKE COMPANY.—"Manufacture of organic compounds." No. 34,368.

GOPCEVICH, C. T.—"Gas-burners." No. 33,748.

GUIMBAIL, P.—"Lamp-lighting mechanism." No. 34,160.

HELLMANN, O.—"Charging furnaces, &c., for distillation of coal, &c." No. 34,052.

HUGHES, A. W.—See Commin, F. J. No. 34,306.

IPSWICH GAS LIGHT COMPANY.—"Gas-burners." No. 33,762.

JOHNSON, P. G.—"Pipe-joints." No. 34,172.

KNIGHT, J.—"Gas-burner." No. 34,011.

LEA, J. E.—"Apparatus for measuring and/or recording flow of liquids." No. 34,352.

LILLEY, J. H.—See Cowen, M. No. 34,375.

LYNCH, H. L —See Knight, J. No. 34,011.

OWENS, C. W.—"Geysers." No. 34 257.

PARKINSON & W. & B. COWAN, LTD.—"Inflammable-vapour lamps." No. 34,392.

PARLANGE C.—See Guimbail, P. No. 34,160.

PEARCE, F. R. R. J.—"Gas or oil stoves." No. 34,254.

PRENTICE, F.—See Ipswich Gas Light Company. No. 33,762.

RIDE, J., and RIDE & BELL, LTD.—"Means for discharging coke from gas-retorts." No. 33,731.

SMITH, H. E.—"Incandescent gas-burners." No. 34,036.

STENNING, H. A.—"Connecting pipes together." No. 34 167.

VICTAULIC COMPANY, LTD.—See Johnson, P. G. No. 34,172.

WARD, L.—"Pumps for compressing, exhausting, and moving air and gases." No. 34,304.

WEST, E. F. J., and WEST'S GAS IMPROVEMENT COMPANY, LTD.—"Gas off-take pipes of vertical retorts." No. 34,169.

WILSON, B. E. W.—"Incandescent gas-light fittings." No. 34,209.

Cheaper Gas in Hull.—A communication from the British Gas Light Company has been received by the Hull Corporation Water and Gas Committee, stating that the price of the gas (which is supplied in bulk to the Corporation for the old town) will be reduced on Jan. 1, from 3s. 4d. to 3s. per 1000 c.ft. This reduction will be made to the consumers.

Good Showroom Results at Smethwick.—Mr. S. W. B. Stephen (Chairman of the Gas Committee), at the last meeting of the Smethwick Town Council, mentioned that the results of the opening of the showroom had been very satisfactory. The sales of cookers and fittings had been very much ahead of anything the department had previously experienced.

Concessions at Coventry.—Reductions have been sanctioned by the Coventry City Council, of from 1d. to 2d. per 1000 c.ft. in the charges for gas on quarterly and monthly accounts, with certain exceptions, and of 4d. in the case of prepayment meters. It was explained that the more stabilized position of the coal and residual markets, in conjunction with other economies effected, would result in such increased revenue that the reductions were justified. It was also decided that a discount of 5 p.ct. be allowed to consumers upon payment of accounts within 21 days.

New Showroom at St. Austell.—An excellent up-to-date showroom for the St. Austell Gas Company has recently been formally opened by Mrs. William Coode, the wife of the Chairman. This should still further assist the rapid progress that is being made by the Company, whose output in the last 22 years has very nearly trebled. Mr. Coode said the new showroom had been built by their own men, and great credit was due to Mr. H. E. Riley (the Engineer, Manager, and Secretary), who had been the architect. The Directors had every reason to be proud of the relationship that existed between the management and the men. Mr. Riley presented Mrs. Coode with boxes of confectionery, which he said had been made by the use of gas cooking appliances. Mr. S. J. Ingram (the Managing Director of the Truro Gas Company) proposed a vote of thanks to Mrs. Coode. Later some of those present were shown over the gas-works by Mr. Riley.

Accidental Gas Poisoning Fatality at Manchester.—A man named Frederick Hulme was found dead in bed at his lodgings in Ardwick; and at the inquest, his landlady, Mrs. Harwood, explained that in the morning a man from the Manchester Gas Department came to the house to attend to the gas, as the result of her complaints. He asked her to turn out all lights; but she did not go to the room Hulme occupied, as she was not aware his gas was lit. Returning to the house in the afternoon, she was told there was a smell of gas, but could not open Hulme's door. On its being forced it was found that the room was full of gas, and the tap turned on. Hulme was dead. The Coroner, returning a verdict of "Death from gas poisoning," said it was evident that Hulme had his gas alight when the workman turned the supply off at the meter, and when the gas was turned on again it escaped into the room. It was very unfortunate that Mrs. Harwood did not take greater precautions.

STOCK MARKET REPORT.

BUSINESS on the Stock Exchange last week was not altogether as uninteresting as might have been expected from the meagre holiday proportions to which it had fallen the week before. There was much variety in tone. Monday was a bright day, and gilt-edged was firm. Home Governments rose, Home Rails were in demand, and the Foreign Market presented some strong points, especially French and Turkish. Tuesday was less bright, and Home Governments were realized. Wednesday was dull, and markets had a moribund appearance, with lower prices mostly. Thursday rallied on better Conference chances; but business was fast dying down. Friday might almost have been a holiday, so small was the attendance. Movements were slight and capricious. The big four closed practically unchanged—viz.: Consols 55⅝-56, War Loan 99 9/16-99 9/32, Funding 85⅝-86, Victory 88½-88 9/16.

Business in the Gas Market was very fair in point of volume, having regard to the times; and the tone generally was satisfactory, though not every movement was an advance. In the London Companies, Gas Light maximum rose 1; but ditto debenture fell 1, South Metropolitan fell ½, and ditto 3 p.c. debenture 1. Commercials were firm and unchanged. In Suburban and Provincial, Bournemouth preference rose ½, British 1, and Southampton 2. In Continentals, Imperial rose 2; but Union fell 3. Elsewhere, Monte Video fell 3; but Primitiva preference rose ⅛.

The following transactions in gas were recorded during the week: On Monday, Brighton and Hove original 168, 169, European 9½, 9⅜, 9 11/16, Gas Light ordinary 94½, 94⅜, 94⅝, 95, 95¼, ditto 4 p.ct. preference 78½, Imperial Continental 156, 158, 159, 160, ditto 3½ p.ct. debenture 80½, 81, Monte Video 55, Primitiva 13s. 3d., ditto 5 p.ct. preference 45s. 7½d., 46s. 10½d., 47s., South Metropolitan 94, ditto 3 p.ct. debenture 60, Tottenham 4 p.ct. debenture 75, Croydon 7½ p.ct. preference 102½, Liverpool 7 p.ct. preference 106, 106½, Swansea 7 p.ct. preference 104 3/16, 104½, Harrow and Stanmore 5 p.ct. 87, 87½. On Tuesday, Cape Town 6⅝, Commercial 4 p.ct. 95⅝, ditto 3½ p.ct. 95½, European 9⅛, 9 3/32, Gas Light ordinary 94⅜, 94⅜, 94½, 94⅝, 95, ditto 3½ p.ct. maximum 63⅛, 64⅛, Imperial Continental 157, 158, 160, ditto 3½ p.ct. debenture 79½, 81, Primitiva 5 p.ct. preference 46s. 3d., South Metropolitan 94, 94½, 95, ditto 3 p.ct. debenture 60 3/16, ditto 6½ p.ct. debenture 106½, South Suburban 98, 98½, ditto 5 p.ct. debenture 98½, 99, Tottenham "B" 101, Liverpool 7 p.ct. preference 105½, Preston 7 p.ct. "B" 101½, 102. On Wednesday, Alliance and Dublin 64⅜, Bournemouth "B" 11 1/16, Brentford "A" 100, Brighton and Hove "A" 123⅜, British 33⅞, 33⅞, Commercial 4 p.ct. 94, ditto 3 p.ct. debenture 57⅜, Continental Union 7 p.ct. preference 54, Gas Light ordinary 94⅜, 94⅝, 94⅝, 95, ditto 4 p.ct. preference 77½, ditto 3 p.ct. debenture 59½ 60½, Imperial Continental 156, 157, 157⅜, 158, 159, Lea Bridge 97, Primitiva 5 p.ct. preference 47s. 6d., 48s., South Metropolitan 94, Southampton 80½, 81½, Tottenham "B" 100¾, 101, Barnet "A" 119, 119½, ditto "B" 107, 107½, ditto "D" 85⅜, 86. On Thursday, Brighton and Hove "A" 124½, British 34½, Commercial 3 p.ct. debenture 56⅜, Gas Light ordinary 94⅛, 94⅛, ditto 3½ p.ct. maximum 64½, ditto 4 p.ct. preference 77, 78½, Imperial Continental 158, Primitiva 5 p.ct. preference 47s., 48s. 1½d., South Metropolitan 94, 94⅛, 95, ditto 3 p.ct. debenture 59, Tottenham "B" 100½, ditto 6 p.ct. mortgage bonds 100, Swansea 7 p.ct. preference 104½. On Friday, British 34⅛, 34½, Gas Light ordinary 94½, 94⅜, 95, 95⅛, Imperial Continental 156, 156½, 158, 158½, 160, Primitiva 13s. 6d., ditto 5 p.ct. preference 46s. 3d., 47s. 6d., South Metropolitan 94½, Colonial 7 p.ct. preference 15s. 6d., 15s. 7½d.

In the Money Market, there was a good deal of animation; there being on the one hand a fairly considerable demand for ordinary purposes coupled with some pressure to effect satisfactory arrangements for the New Year, and, on the other hand, an array of supplies sufficient to meet all requirements. In the end everything went smoothly. Discount rates were steady to firm. Silver was little changed at 30⅝d. The Bank of England rate was 3 p.ct., as fixed on July 13.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S TRANSACTIONS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Transactions.
£			p.c.					
182,049	Stk.	Aug. 24	4	4%	Aldershot 4 p.c. Pref.	..	68—73	...
1,551,868	,,	Oct. 5	2½	5%	Alliance & Dublin Ord.	59—64	62—67	64⅜ ex
374,000	,,	July 13	4	4%	Do. 4 p.c. Deb.	76—79	60—65	...
280,000	5	Oct. 19	7½	4/-	Bombay, Ltd.	5⅛—6⅛	4⅛—5	...
100,000	5	Aug. 10	16	7½%	Bournemouth Gas and Water { 5 p.c. B 7 p.c. Pref. 6 p.c. 4 p.c. Deb.	..	11—12	...
383,110	10	,,	7	7%		15—15⅛	11—12	11 1/16
115,000	10	,,	6	6%		13⅛—14	9—10	...
162,065	—	June 29	—	4%		..	73—78	...
992,045	Stk.	July 27	14	61/-	Brentford A Consolid.	261—266	100—103	100
734,920	,,	,,	11	61/3	Do. B New	204—209	100—103	...
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	82—87	...
221,400	,,	Dec. 14	4	4%	Do. 4 p.c. Deb.	91—93	75—80*	...
214,775	,,	Aug. 24	11	11%	Brighton & Hove Orig.	208—213	165—170	168—169
244,200	,,	,,	8	8½%	Do. A Ord. Stk.	154—159	120—125	123⅛—124½
1,287,500	Stk.	July 28	5	5%	Bristol 5 p.c. max.	..	89—91	..
530,000	20	Oct. 5	12½	22/6	British	44—45	33—35	33⅞—34⅛
120,000	Stk.	June 29	4	4%	Do. 4 p.c. Deb. Stk.	88—90	75—80	...
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	55—60	...
100,000	10	Nov. 2	—	—	Cape Town & Dis., Ltd.	1⅛—2⅛	6⅛—7⅛	6⅞
100,000	10	Oct. 19	—	—	Do. 4½ p.c. Pref.	4—6	6—7	...
100,000	Stk.	June 29	4½	—	Do. 4½ p.c. Deb. Stk.	70—75	73—78	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	..	...
1,513,280	,,	July 27	5/9/4	56/-	Commercial 4 p.c. Stk.	106—108	93—98	94—95⅛
560,000	,,	,,	5⅛	55/-	Do. 3½ p.c. do.	103—105	93—98	95⅛
475,000	,,	Dec. 14	3	3%	Do. 3 p.c. Deb. Stk.	69⅛—71⅛	55—60*	56⅛—57⅛
800,000	,,	Dec. 15	4	—	Continental Union, Ltd.	76—79	26—31	...
200,000	,,	Dec. 14	7	3%	Do. 7 p.c. Pref.	115—118	52—57*	54
660,000		Sept. 1	—	6%	Croydon sliding scale.	..	96—101	...
284,975		,,	—	5%	Do. max. div.	..	80—85	...
492,270	Stk.	—	6	4½%	Derby Con. Stk.	123—125	..	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	..	...
1,002,180	10	July 13	10	5/0	European, Ltd.	17⅛—18	9⅛—10⅛	9⅛—9 11/16
16,298,975	Stk.	July 27	4/17/4	52/-	Gas { 4 p.c. Ord. 3½ p.c. max.	98—102	94—96	94⅛—95⅛
2,600,000	,,	,,	3½	35/-		76—79	62—65	63⅛—64⅛
4,062,235	,,	,,	4	4%	Light { 4 p.c. Con. Pref.	96—99	76—81	77—78⅛
4,674,850	,,	Dec. 14	3	3%	and { 3 p.c. Con. Deb.	72⅛—74⅛	59—62*	59⅛—60⅛
130,000	,,	Dec. 11	10	10%	Coke { 10 p.c. Bonds 7½ p.c. Ilford Deb.	..	..	..
	—	—	—	—		..	..	..
82,500	,,	Sept. 21	5	65/7½	Hastings & St. L. 5 p.c.	..	95—100	...
258,740	,,	,,	3⅛	50/7½	Do. 3½ p.c.	87—89	77—80	...
70,000	10	May 18	11	7½%	Hongkong & China, Ltd.	16⅛—16⅞	6—7	...
86,600	Stk.	Aug. 24	9	9½%	Hornsey 7 p.c.	..	127—132	...
1,976,000	,,	Nov. 16	9	£5	Imperial Continental	150—160	155—160	155—160
404,800	,,	Aug. 10	3⅛	3⅛%	Do. 3½ p.c. Deb. Red.	84—86	77—82	79⅛—81
235,242	,,	July 27	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	95—100	97
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord.	..	..	...
165,736	,,	Aug. 10	7/5/6	87/3	Maidstone 5 p.c.	..	87—92	...
63,480	,,	June 29	—	3%	Do. 3 p.c. Deb.	..	54—59	...
75,000	5	,,	6	6%	Malta & Mediterranean Met. of Melbourne { 4½ p.c. Deb.	4⅛—4½	3½—4	...
60,000	5	—	10	—		..	..	...
250,000	100	Oct. 3	4½	4½%		99—101	97—100	...
541,920	Stk.	Nov. 30	4	4%	Monte Video, Ltd.	11⅛—12	55—60	55
1,875,892	,,	July 27	4½	4½%	Newcastle & Gatsh'd Con.	98⅛—99⅛	81—82	...
529,705	,,	June 29	3½	3½%	Do. 3½ p.c. Deb.	82—83	69—71	...
15,000	10	Aug. 26	—	7/6	North Middlesex 10 p.c.	..	..	...
55,940	10	Aug. 24	7/14/0	7/8⅜	,, ,, 7 p.c.	14—15	10½—11½	...
300,000	Stk.	Nov. 30	8	8%	Oriental, Ltd.	117—122	95—100	...
60,000	5	—	10	—	Ottoman, Ltd.	7⅛—7½	⅛—1⅛	...
188,120	Stk.	June 29	—	6/3/9%	Plym'th & Stonh'se 5 p.c.	..	93—98	...
60,000	50	Aug. 24	13	65/-	Portsea Island, B	128—131	100—105	...
100,000	50	,,	12	60/-	Do. C	118—121	85—90	...
249,980	5	—	8	—	Primitiva Ord.	5⅛—6	1/16—1/8	13/3—13/6
499,060	5	—	5	—	Do. 5 p.c. Pref.	4⅛—5	2⅛—2⅝	45/7½—48/1½
521,600	ind	Nov. 30	4	4%	Do. 4 p.c. Deb.	91—93	68—73	...
600,000	Stk.	July 27	4	4%	Do. ,, ,, 1911	..	53—60	...
346,198	,,	June 29	4	4%	River Plate 4 p.c. Deb.	85—87	55—60	...
150,000	10	Sept. 21	6	6/-	San Paulo { 6 p.c. Pref. 5 p.c. Deb.	10⅛—11	5⅛—6	...
125,000	50	July 3	5	5%		47—49	35—38	...
135,000	Stk.	Aug. 24	10	5%	Sheffield A	223—224	97—99	...
209,984	,,	,,	10	5%	Do. B	222—224	97—99	...
52,500	,,	,,	10	5%	Do. C	220—222	97—99	...
133,201	Stk.	Sept. 15	4	4%	Shrewsbury 5 p.c.	..	..	...
90,000	10	Nov. 2	9	7½%	South African	10⅛—11⅛	7—9	...
6,609,895	Stk.	July 27	5/4/0	5%	South Met. Ord.	111—113	93⅛—93⅞	94—95
250,000	,,	July 13	—	5%	Do. Red. Pref.	..	95—97	..
1,895,445	,,	,,	3	3%	Do. 3 p.c. Deb.	72⅛—74⅛	59—62	59—60 3/16
224,820	,,	Aug. 24	8⅛	8½%	South Shields Con. Stk.	157—159	108—110	...
1,087,795	,,	,,	6	6%	S'th Suburb'n Ord. 5 p.c.	114—116	97—100	98—98⅛
368,837	,,	June 15	5	5%	Do. 5 p.c. Deb. Stk.	116—118	95—100	98⅛—99
647,740	,,	Nov. 2	5	7½%	Southampton Ord.	99—102	80—83	80⅞—81⅛
121,275	,,	June 29	4	4%	Do. 4 p.c. Deb. Stk.	..	70—75	...
120,000	,,	July 27	—	7½%	Tottenham { A 5 p.c. B 3½ p.c. 4 p.c. Deb.	135—138	112—117	...
782,275	,,	,,	6	6%		115—117	100—103	100⅛—101
181,255	,,	Dec. 14	4	4%		87—89	73—80*	75
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	⅛—⅜	...
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	20—30	...
236,476	Stk.	Aug. 24	3	2⅛%	Tynemouth 5 p.c. max.	108⅛—109	79—81	...
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	July 27	8⅛	72/6	Wandsworth A 5 p.c.	151—156	111—115	...
455,636	,,	,,	6⅛	57/6	Do. B 3½ p.c.	129—134	93—100	...
108,073	,,	,,	—	50/9	Do. C.	..	87—92	...
140,865	,,	,,	—	50/9	New Ordinary	..	87—92	...
352,000	,,	,,	6⅛	53/9	Wimbledon 5 p.c.	117—122	95—100	...
98,000	,,	,,	6⅛	58/9	Epsom 5 p.c.	121—126	95—100	...
88,416	,,	June 29	3	3%	3 p.c Deb. Stk.	66—69	57—60	...

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Theft from a Gas-Meter.—Before the Tunbridge Wells Borough Bench, William Ticehurst was charged with stealing from a gas-meter the sum of 2s., and further with damaging the meter to the amount of 2s. 6d. He pleaded guilty, and was stated to be well known to the police. The Chairman said Ticehurst had had chance after chance to retrieve his character, but had failed to do so. He would be sent to prison for three months with hard labour on the first charge, and two months hard labour on the second charge, the sentences to run consecutively.

Dublin Price Reduction.—A reduction is now announced by the Alliance and Dublin Consumers' Gas Company of 1d. per therm, or 4½d. per 1000 c.ft., in the price of gas. At a meeting of the Citizens' Association, Mr. W. E. Taylor contrasted the price of gas in Dublin with that prevailing in Belfast, and described the therm system as a delusion and a snare. Traders in Dublin, he said, had to pay at the rate of 6s. 9d. per 1000 c.ft. for light and 6s. 6d. for power; while in the northern city, though the same class of coal at similar price was used, the charges were 3s. per 1000 c.ft. for domestic purposes and 2s. 6d. for power. The discussion was not pursued.

Burnley Gas Charges.—The Burnley Gas Committee decided to recommend the Council to make a reduction of ½d. per therm in the price of gas, from the December meter readings. They have also resolved that the charge for public lamps lighted the full period be fixed at £5 3s. 6d. per lamp per annum; and that for restricted lighting a fixed charge be made of 7s. 6d. per lamp per annum for all lamps whether lighted or not, and a charge at the rate of £4 16s. for every 3900 hours each lamp is lighted.

There is an increasing demand for gas at Hamilton; and the Town Council have decided upon the erection of a new gasholder as soon as possible.

The Smethwick Gas Committee have reported to the Town Council that the Engineer had presented a report upon a recent examination of the service-pipes in various parts of the town, showing that in many cases the pipes were perforated by corrosion. The Engineer suggested that the necessary replacement should be commenced at once, and be spread over four or five years.

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J. ERNEST JARRATT,
Town Clerk.

Town Hall,
Southport.
Dec. 6, 1922.

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COMPANY NOTICES.

THE GAS LIGHT AND COKE COMPANY.

NOTICE is Hereby Given that the TRANSFER BOOKS of this Company, SO FAR AS THEY RELATE TO CAPITAL STOCKS, WILL BE CLOSED at 4 o'clock p.m. on Tuesday, the 2nd day of January next, and will be RE-OPENED immediately after the Ordinary General Meeting of the Company, to be held on Friday, the 2nd day of February next.

By order,
WILLIAM LYLE GALBRAITH,
Secretary.

Chief Office,
Horseferry Road,
Westminster, S.W. 1.
Dec. 19, 1922.

CEARA GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the ORDINARY ANNUAL GENERAL MEETING of the Shareholders will be held at the Office of the Company, No. 9, Queen Street Place, in the City of London, on Thursday, the 28th day of December, 1922, at One o'clock in the afternoon, to receive the Report of the Directors; to elect a Director and an Auditor; and for General Purposes.

By order of the Board,
E. PRATT,
Secretary.

Dec. 21, 1922.

PATENTS AND DESIGNS ACTS, 1907 & 1919.

NOTICE is hereby given that Moore's GAS GENERATOR SYNDICATE, LIMITED, of 1, Upper Woburn Place, London, W.C. 1, seek leave to amend the Specification (including the drawings) of Letters Patent No. 168,951 granted to Samuel Moore for "A NEW OR IMPROVED GAS GENERATOR."

Particulars of the proposed amendment were set forth in the Illustrated Official Journal (Patents), issued on the 20th of December, 1922.

Any person or persons may give notice of Opposition to the Amendment by leaving Patents Form No. 19 at the Patent Office, 25, Southampton Buildings, London, W.C. 2, within one calendar month from the date of the said Journal.

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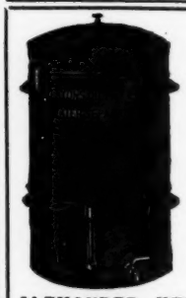
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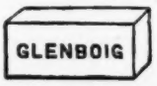
TRADE 

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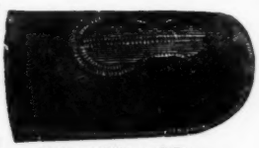
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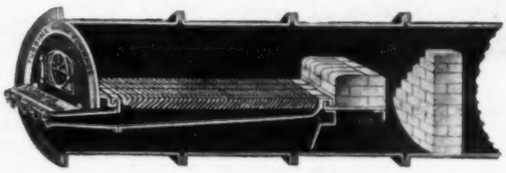

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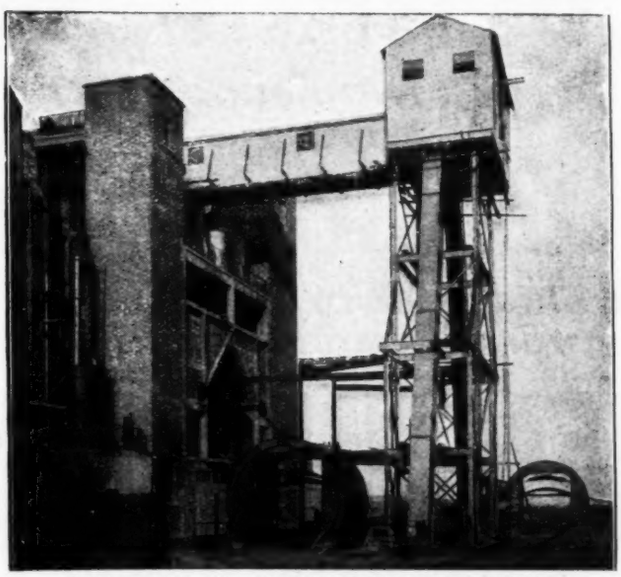
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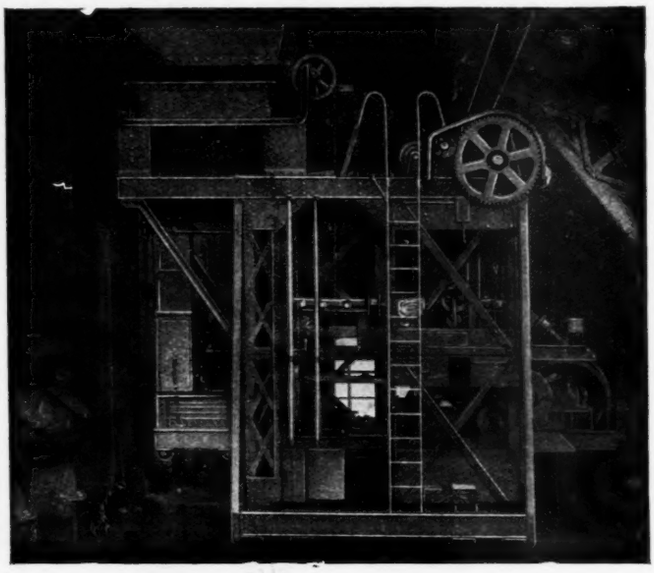

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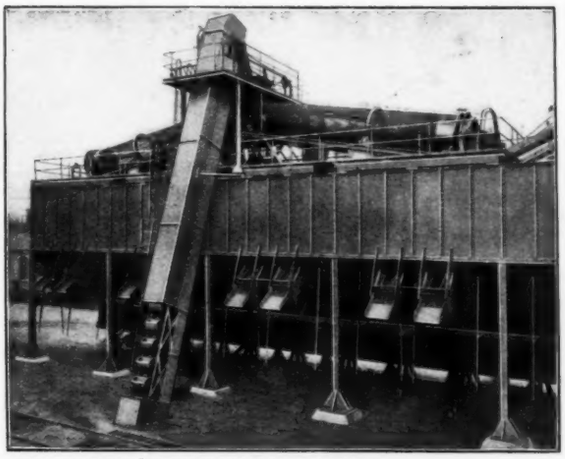

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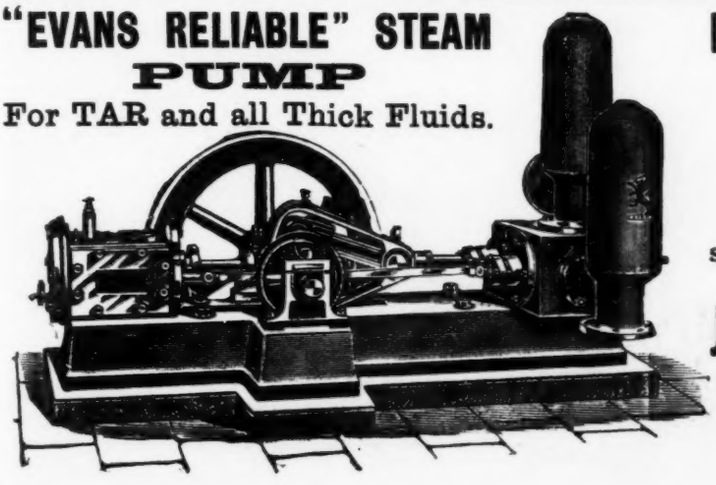

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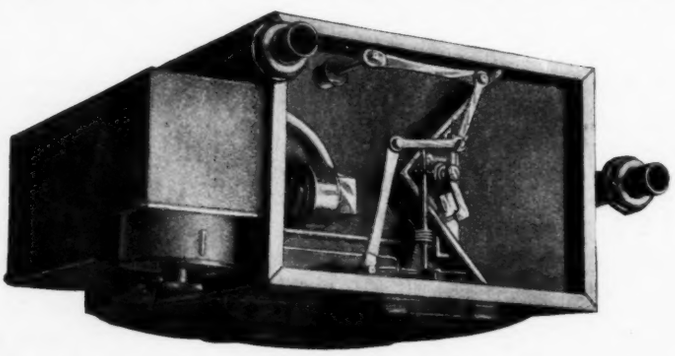

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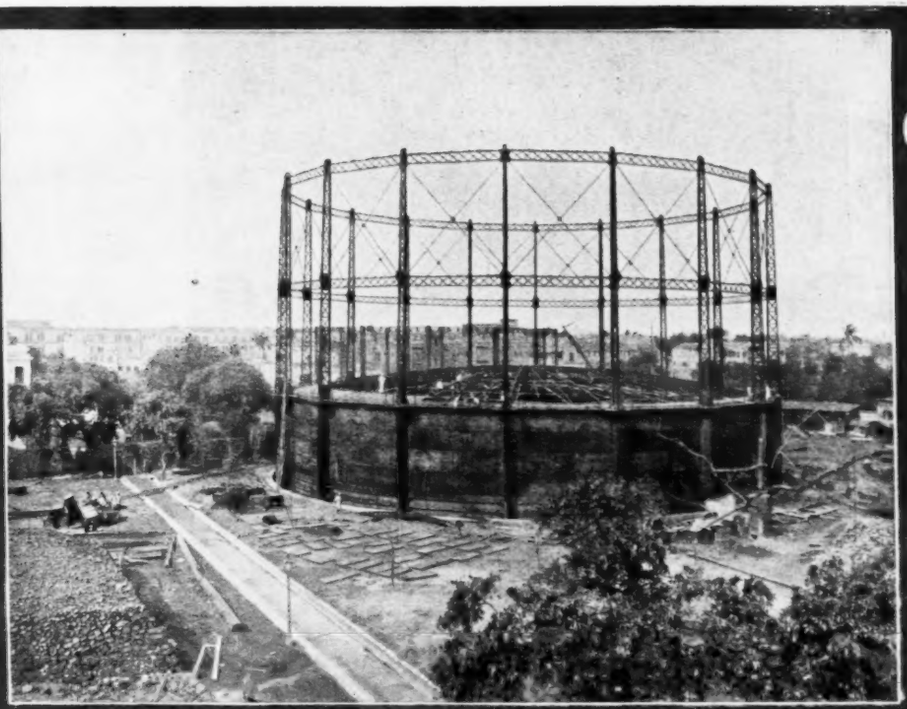

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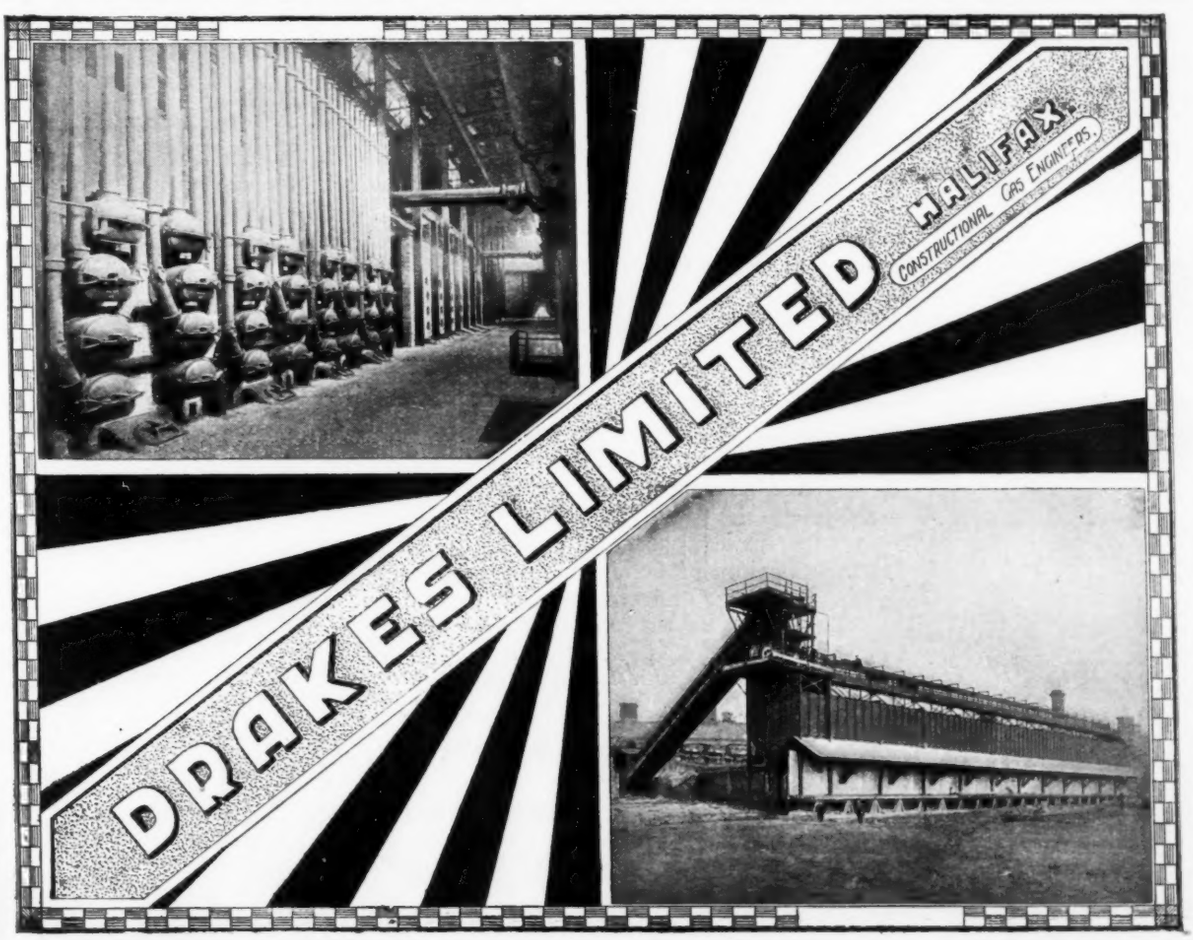

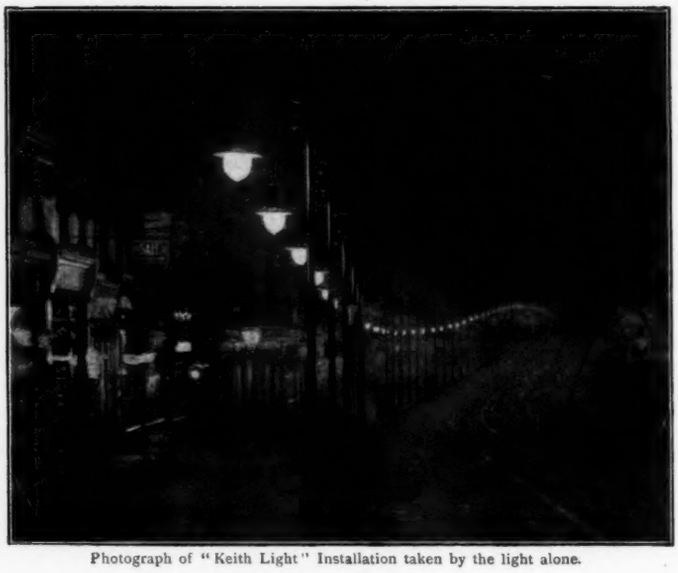

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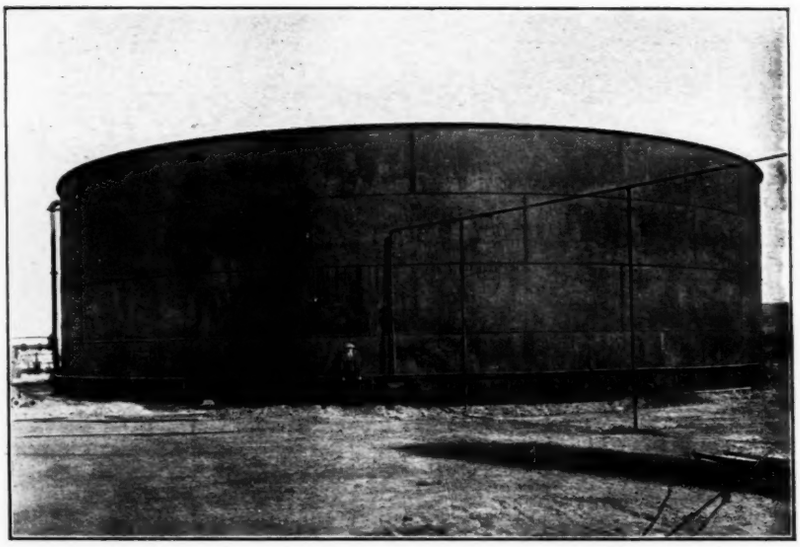

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